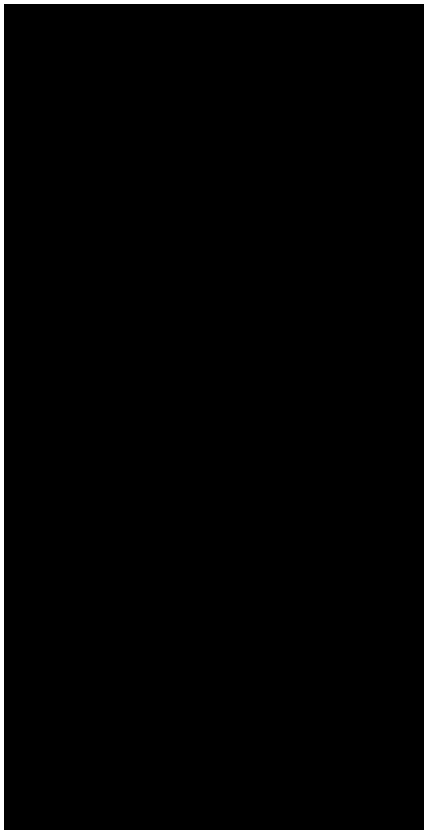
USDA

United States Department of Agriculture

Natural Resources Conservation Service

Proceedings of Western Region ad Conference

National Cooperative Soil Survey



Albuquerque, New Mexico
Wyndham Garden Hotel
June 15 - 19, 1998

Table of Contents **Page**

WESTERN REGIONAL CONFERENCE
National Cooperative Soil Survey
June 15 – 19, 1998
Wyndham Garden Hotel
Albuquerque, New Mexico

Sunday, June 14

1:00 - 5:00 p.m.	Registration

Monday, June 15 ***Moderator: Steve Strenger, USFS***

8:00 - 12:00 p.m.	Registration
9:00 - 9:10 a.m.	Opening Remarks - *Kenneth Schefte, Conference Co-Chair, NRCS, AlNup4erque, NM*
9:10 - 9:20	Welcome by Natural Resources Conservation Service - *Rosendo Trevino 111, State Conservationist, Albuquerque, NM*
9:20 - 9:30	Welcome by New Mexico State University - *Dr. LeRoy Daugherty, Associate Dean, Agricultural College, Las Cruces, NM*
9:30 - 9:40	Welcome by Bureau of Land Management - *Michelle Chavez, State Director, BLM, Santa Fe, NM*
9:40 - 9:50	Welcome by Forest Service - *Art Briggs, Director of Ecosystem Analysis, Watershed Planning and Air, USFS, Albuquerque, NM*
9:50 - 10:00	Welcome by Bureau of Indian Affairs - *John Martin, Chief, Branch of Natural Resources, BIA, Gallup, NM*
10:00 - 10:30	Break
	Agency Reports
10:30 - 10:45	Natural Resources Conservation Service - *Horace Smith, Director, Soil Survey Division, Washington, DC*
10:45 - 11:00	West Regional Agricultural Experiment Stations - *Dr. Curtis Monger, NMSU, Las Cruces, NM*
11:00-11:15	Bureau of Land Management - *Colin Voigt, BLM, Washington, DC*
11:15 - 11:30	Forest Service - *Jim Keys, National Soils Specialist, USFS, Washington, DC*

Monday, June 15 Continued

11:30 - 11:45	National Park Service - *Lee Benson, COTR, NPS, Phoenix, AZ*
11:45 - 12:00	Bureau of Indian Affairs - *Steve Wangeman, BIA, Gallup, NM* - *Bob HetZleT, BIA, Phoenix, AZ*
12:00 - 1:00	LUNCH
1:00 - 5:00	Agency Breakout Sessions NRCS, USFS, Dept. of Interior, CES and Universities

Tuesday, June 16 ***Moderator: Russ Kraph, BLM***

8:00 - 8:30 a.m.	A New Perspective for the NSSC - *Jim Culver, NRCS, National Soil Survey Center, Lincoln, NE*
8:30 - 9:00	Soil Health Card Project - *Arlene Tugel, NRCS, Soil Quality Institute, Las Cruces, NM*
9:00 - 9:30	Soil Condition Interpretations - *Penny Luehring, USFS, Albuquerque, NM*
9:30 - 10:00	Eco-geomorphic systems in the Chihuahuan Desert - *Dr. Curtis Monger, NMSU, Las Cruces, NM*
10:00 - 10:30	BREAK
10:30 - 11:00	SSURGO Update - *Tommie Parham, SSURGO Support Branch Leader, NRCS, Ft. Worth, TX*
11:00 - 11:30	Report on DOQQ and NAPP - *Jim Ware, Soil Survey Division, NRCS, Washington, DC*
11:30 - 11:45	Field Trip Briefing - *Wayne Robbie, USFS*
11:45 - 1:15	LUNCH
1:15 - 2:15 p.m.	Committee Breakout Session
2:15 - 3:15	Committee Breakout Session
3:15 - 3:45	BREAK
3:45 - 4:45	Committee Breakout Session
6:30 - 8:30	West Region Soils Consortium Meeting

Wednesday, June 17

7:30 a.m. – 6:30 p.m.	Field Trip - "The Enchanted Circle - Northern New Mexico" Busses depart from Wyndham Garden Hotel parking lot at 7:30 a.rn.

Thursday, June 18 am ***Moderator: Lee Benson, NPS***

8:00 - 9:00 a.m.	Mineland Soils: Their Diversity and Productivity *- Dr. Bruce Buchanan, Buchanan Consultants, Ltd.,Farmington, NM*
9:00 - 9:40	Jornada LTER and ARS - Soil/Range Heath *- Jeff Herrick, USDA-ARS Jornada Experimental Range, Las Cruces, NM* *- Laura Huenneke, USDA-ARS Jornada Experimental Range, Las Cruces, NM*
9:40 - 10:15	NRI and Rangeland Health/Soil Quality *- Al Amen, BLM, Colorado* *- Scott Davis, BLM, Colorado*
10:15 - 10:45	BREAK
10:45 - 11:15	Soil Scientists in the Private Sector *- Barry Dutton, President Elect, National Society of Consulting Soil Scientists, Missoula, MT*
11:15 - 11:45	Open Discussion
11:45 - 1:00	LUNCH

Thursday, June 18 pm ***Moderator: Hayes Dye, NRCS***

1:00 - 1:30 p.m.	Formation of Regional Technical Committee For Hydric Soils *-Russ Pringle, Wetlands Science Inst., NRCS, Baton Rouge, LA*
1:30 - 2:00	Wetlands Science Institute Report *- Russ Pringle, Wetlands Science Inst., NRCS, Baton Rouge, LA*
2:00 - 2:30	BREAK
2:30 - 4:30	Poster Session & Demonstrations

Friday, June 19 ***Moderator: Eric Brooks, USFS***

8:00 - 8:30 a.m.	National Soil Information System (NASIS) Status Update *- Jim Fortner, NSSC, NRCS, Lincoln, NE*
8:30 - 9:00	Soil Taxonomy Update *- Robert Engel, NSSC, Lincoln, NE*
9:00 - 10:30	Committee Reports
10:30	Adjourn *- Kenneth Scheffe, Conf. Co-Chair, NRCS, Albuquerque, NM*
10:30-12:00	Business Meeting
1:00- 2:30	Conference Steering Committee Meeting

National Cooperative Soil Survey

Western Regional Conference

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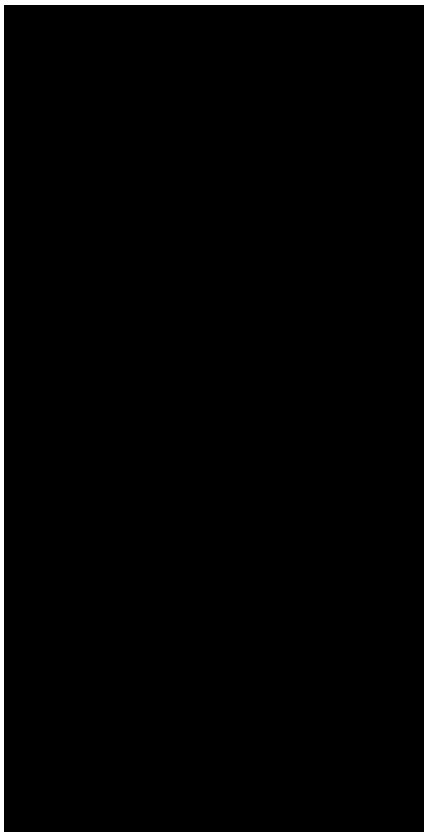

Monday June 15,1998

Welcome and Opening Remarks

Welcome to Albuquerque! Ken Scheffe

Thank you for participating in the 1998 Western Regional Conference of the National Cooperative Soil Survey

I'm happy to be able to welcome you here to New Mexico, Land of Enchantment. We all hope you find your visit here as enjoyable as we find living here.

Hope we can provide an interesting conference, enjoyable field trip to the northern New Mexico mountains, and a chance to see some old friends and make new ones, too.

Any questions or need help? If you need help, see me, or

Stevanie Running Hawk
Jessie Rosbach
Linda Segura
Clarence Chavez
(We're wearing the nametags trimmed in RED.)

NRCS State Office is across I-25 at 6200 Jefferson, 3rd floor. We have fax, phone, email, copy and printing services.

Map of nearby restaurants found inside conference binder, lunch also available at hotel. Free 1st drink each every day for hotel guests.

Hospitality room on second floor, south hallway.

If you haven't had time to register, please do so during the first break. Please complete and turn in blue lunch order form for field trip on Wednesday. Turn in by noon today so meals can be ordered.

Rooms for Breakout Sessions and Agency meetings are as follows" Agency Breakout:

NRCS - Salon ABC
US Forest Service - Salon E
Dept. of Interior Agencies - Salon F
All others welcome to join any of the breakout sessions.

Ground Rules:

Please be prompt for start of each session.
Give biographical sketches to moderators.
Have handouts ready for distribution before your talk.
(Your handouts becomes the proceedings)

Welcome by New Mexico State University
LeRoy A. Daugherty
Associate Director, Agricultural Experiment Station

It is my pleasure to welcome the conference attendees on behalf of New Mexico State University and the College of Agriculture and Home Economics. New Mexico State University (NMSU) is the Land Grant University in New Mexico. In that capacity, we have had a long history as a part of the National Cooperative Soil Survey. NMSU is a Carnage I Research University that has a strong commitment to education. Current enrollment is more than 15,000 students. NMSU is the only University that combines Land Grant distinction with Carnage I status and is classified as a minority institution (minority enrollment 42%).

The College of Agriculture and Home Economics has been consistently growing and has an enrollment of 1,319 undergraduates and 282 graduate students. Academic departments include: Agricultural Economics and Agricultural Business, Agricultural and Extension Education, Agronomy and Horticulture, Animal and Range Science, Entomology and Plant Pathology, Family and Consumer Sciences, Fishery and Wildlife Sciences, and Hotel, Restaurant and Tourism Management. Degrees in the College range from BS through PhD. A BS in soil science is still offered. MS and PhD degrees are offered in Agronomy. A relatively new BS in Environmental Science is offered in the College.

Research in the Agricultural Experiment Station focuses on issues that matter to our constituents. A mixture of basic and applied research is conducted on topics ranging from molecular biology and genetics to global warming. Much of the research supports the major commodities in the state. The top 10 commodities in New Mexico are: Cows and Calves, milk, hay, chile, onions, greenhouse nursery commodities, cotton, corn, potatoes, and wheat.

NMSU is a partner with numerous federal agencies in fulfilling its mission in teaching, research and service. Federal formula funding, however, accounts for only 8% of the annual budget of the Agricultural Experiment Station. Research grant funding comes from numerous agencies in addition to those in USDA. Substantial funding is received from the National Science Foundation, the National Institute of Health, Department of Education, Department of Energy, Department of Defense and others.

WESTERN REGIONAL COOPERATIVE SOIL SURVEY CONFERENCE

Opening Remarks and Welcome by Art Briggs, Director
USDA Forest Service, Southwestern Region
Ecosystem Analysis and Planning.
Watershed and Air Resources

GOOD MORNING. WELCOME TO ALBUQUERQUE. NEW MEXICO, AND THE SOUTHWESTERN REGION OF THE FOREST SERVICE. WE'RE VERY PLEASED TO SERVE AS YOUR CO-HOSTS FOR YOUR STAY IN NEW MEXICO THIS.WEEK.

THE SOUTHWESTERN REGION COVERS MORE THAN 22 MILLION ACRES AND INCLUDES 12 NATIONAL FORESTS IN ARIZONA AND NEW MEXICO, AND FOUR NATIONAL GRASSLANDS IN NEW MEXICO, OKLAHOMA AND TEXAS. THERE ARE FIVE NATIONAL FORESTS IN NEW MEXICO. YOU WILL BE VISITING TWO OF THESE NATIONAL FORESTS, THE CIBOLA AND SANTA FE NATIONAL FORESTS DURING YOUR FIELD TRIP ON WEDNESDAY. I AM PLEASED THAT WAYNE ROBBIE HAS CHOSEN TO TAKE YOU TO THESE FORESTS BECAUSE THE REGION IS PROUD OF IT'S RESEARCH AND MANAGEMENT WHICH WILL BE SHOWCASED.

THE FOUNDATION FOR THIS RESEARCH AND MANAGEMENT LIES WITHIN THE RESOURCE INVENTORY INFORMATION WHICH INCLUDES SOILS DATA FROM OUR

OUR ECOLOGICAL SURVEY. HAS BEEN THE PROTOCOLS AND STANDS SET FORTH BY THE NATIONAL COOPERATIVE SOIL SURVEY. IN ADDITION, THE COOPERATIVE EFFORTS WITH THE NATURAL RESOURCES CONSERVATION SERVICE, STATE UNIVERSITIES (NMSU AND UNIVERSITY OF ARIZONA). BUREAU OF LAND MANAGEMENT, NATIONAL PARK SERVICE, AND BUREAU OF INDIAN AFFAIRS. THROUGH EXISTING MEMORANDUMS OF UNDERSTANDING. HAS SERVED TO ENHANCE THE QUALITY OF THE FOREST SERVICE'S SOILS INFORMATION AND PROVIDE AN INTERAGENCY FORUM FOR TECHNOLOGY TRANSFER. AS PUBLIC LAND MANAGEMENT AGENCIES AND AGENCIES WHICH SERVICE PRIVATE AND TRIBAL LANDS EMBRACE THE CONCEPT OF BOUNDERYLESS MANAGEMENT, THE SERVICES AND PRODUCTS THAT EVOLVE FROM THE NATIONAL COOPERATIVE SOIL SURVEY WILL BE GREATLY VALUED AND UTILIZED NOW AND INTO THE FUTURE.

THE SOUTHWESTERN REGION OF THE FOREST SERVICE HAS VIEWED OUR PARTNERSHIP WITHIN THE NATIONAL COOPERATIVE SOIL SURVEY WITH BOTH A TRADITIONAL AND NONTRADITIONAL PERSPECTIVE. FROM A TRADITIONAL STANDPOINT, WE EMBRACE THE COOPERATION AND DIRECT INVOLVEMENT OF OUR PARTNERS FROM OTHER GOVERNMENT AGENCIES. IN A NONTRADITIONAL PERSPECTIVE, WE SEE THE NEED TO COLLABORATE WITH STATE GOVERNMENT, NONGOVERNMENT ORGANIZATIONS, STAKE HOLDERS'AND SPECIAL INTEREST GROUPS IN BOTH THE OPERATIONAL ASPECTS OF CONDUCTING ECOLOGICAL (SOIL) SURVEYS AND SHARING THE RESULTS (INFORMATION). ORGANIZATIONS SUCH AS THE NATURE CONSERVANCY, THE ARIZONA AND NEWMEXIC0 NATURAL HERITAGE PROGRAMS. STATE ENVIRONMENTAL QUALITY DEPARTMENTS, GRAZING PERMITTEES AND ENVIRONMENTAL OR CONSERVATION ORGANIZATION ARE MORE THAN JUST “CUSTOMERS.” THEYARE ACTIVE PARTICIPANTS

IN' OUR LAND MANAGEMENT DECISION-MAKING PROCESS. THEIR CONFIDENCE IN OUR DECISIONS LIES WITHIN THE QUALITY OF ECOLOGICAL AND SOILS INFORMATION WE USE TO BASE OUR DECISIONS. THE STANDARDS OF THE NATIONAL COOPERATIVE SOIL SURVEY AND MOU'S WE OPERATE WITHIN SERVE AS A SUCCESSFUL MODEL FOR CONSISTENCY AND RELIABILITY OF OUR RESOURCE INFORMATION AND THE UNITY FROM WHICH WE OPERATE WITHIN. THE SIGNIFICANCE OF OUR PARTNERSHIP WITHIN THE NATIONAL COOPERATIVE SOIL SURVEY WILL INCREASE IN THE FUTURE. WITH DECLINING FEDERAL DOLLARS AND FEWER SOIL SCIENCE POSITIONS. THE NECESSITY TO WORK TOGETHER IN A MORE DELIBERATE AND COLLABORATIVE ATMOSPHERE IS PARAMOUNT. THE COMPLEXITIES OF ENVIRONMENTAL ISSUES, LAND MANAGEMENT DECISIONS.AND SOCIAL NEED FOR A BETTER UNDERSTANDING OF THE SOIL RESOURCE IS INCREASING. SOILS RESEARCH FROM OUR UNIVERSITIES AND THE APPLICATION OF THIS RESEARCH THROUGH SOIL SURVEYS AND IT'S INTERPRETATIONS WILL ONLY LEAD US TO A BETTER QUALITY OF LIFE.

IN LOOKING OVER YOUR AGENDA, IT APPEARS YOU HAVE A VERY BUSY WEEK BUT ALSO A VERY INTERESTING AND EDUCATIONAL ONE. TAKE TIME TO ENJOY YOURSELF IN ALBUQUERQUE AND THE NATIONAL FORESTS DURING YOUR FIELD TRIP. JUST REMEMBER TO BE SAFE.

THANK YOU.

Natural Resources Conservation Service Update[1]

By

Horace Smith
Director, Soil Survey Division
USDA, Natural Resources Conservation Service
Washington, DC

Thank you for inviting me to be a part of this conference. This is my first participation in a conference in the Western Region. I look forward to meeting and exchanging ideas with each of you. I've worked in every region except this one, so I'm looking forward to getting better acquainted with each of you. I was hoping that I would be able spend the entire week with you and participate in the field trip, but I've already been notified that I must return to Washington immediately after my presentation to deal with an important issue that has suddenly developed.

I'd like to quickly touch on a few items at the national level that may be of interest to you:

1. National Headquarters Reorganization

In March, Mr. Pearlie S. Reed took over as Chief of NRCS. During this period, the Agency was reorganized or realigned at NHQ. This new structure includes five deputy areas. These are: Strategic Planning and Accountability; Science and Technology; Programs; Soil Survey and Resource Assessment; and Management. The Soil Survey and Resource Assessment Deputy Area contains three Divisions -- Soil Survey, Resource Inventory, and Resource Assessment. This deputy area is led by Dr. Maury Mausbach, Deputy Chief. During this reorganization or realignment, Centers and Institutes were placed under the Divisions. Therefore, the National Soil Survey Center and the Soil Quality Institute are now a part of the Soil Survey Division. Jim Culver in on the agenda and will gave an overview of the reorganized National Soil Survey Center later.

2. Budget

We are now in the middle of the 1999 budget process. It looks like the 1999 soil survey budget will be level. If there is an increase, it will be extremely small. We've asked for special allocations for benchmark initiatives in animal agriculture. We hope the 1999 budget will allow us to continue supporting RFPs and research initiatives that are beneficial to the Agency's and the NCSS' mission.

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[1] Presented at the Western Regional Cooperative Soil Survey Conference, June 15, 1998, Albuquerque, New Mexico

3. Mapping Status and Personnel

The following table gives an overview of mapping status:

NATIONAL SOIL SURVEY MAPPING STATUS
October, 1997 -- Water Acreage Excluded

Category	Total Acres Millions	Acres Mapped Millions	Percent Completed
Private	1521.6	1385.0	91
Indian	99.2	46.6	47
All Federal	649.2	299.3	46
Total	2270.0	1730.9	76

As you can see, we have mapped more than 90 percent of the private land in the US. We now have detailed maps on a little less than 1.4 billion acres of private land. We need to be very careful when we talk about the percent of the private land completed. This percentage is somewhat misleading, as a large portion of this acreage is outdated and in need of updating. This outdated acreage does not support many of the current interpretation for wetlands, highly erodible lands, wildlife, etc., that are essential to Farm Bill mandated applications. The numbers are not as favorable for Federal and Indian lands. As you are fully aware, most of these lands in the U.S. occur in this region. The soils have been mapped on a little less than one-half of all Indian and Federal lands. I commend several of the States in this region for great progress during the past two years on Indian lands. We will have a special budget initiative in 1999 to accelerate soil mapping on Indian lands. This initiative will affect several states in this region.

At the present, there are approximately 935 NRCS soil scientist supporting the NCSS. This is the lowest number in many years. A few days ago I was checking the personnel records and discovered that during the past two years we hired a little over 50 new soil scientists. That's not good enough. During 1999, the Agency has already committed to hire at least 50 new soil scientists. I need your assistance in helping us to locate qualified candidates to fill these 50 new positions. I especially need assistance from the Experiment Station Representatives.

4. Digital Map finishing

A little more than a year ago I commissioned a team to take an in-depth look at digital map finishing and make recommendations to me on how this technique can be used to produce high quality hard-copy maps for soil survey areas utilizing certified SSURGO data. The team came up with some excellent recommendations and we are in the process of evaluating them now. We are now in the process of testing software at several locations that would support digital map finishing in a production mode. We are also in the very early stages of trying to identify locations that have the interest and capability to support digital map finishing centers. As we move further into a digital environment, you will be hearing more about digital map finishing. It is essential that we integrate this technology into our ongoing soil survey processes.

5. National Cooperative Soil Survey Advisory Committee

Shortly after I was named Director of the Soil Survey Division, I set up this committee. Its purpose is to serve as a sounding board for the Division and provide feedback and recommendations on emerging topics that affect the Division. The committee is composed of a representative from the four Agricultural Experiment Station Regions, the 1890 Universities, State Agencies, the soil survey leaders from the US Forest Service and Bureau of Land Management, the president of the National Society of Consulting Soil Scientists, and senior leaders from the Division. Dr. Eugene Kelly, Colorado State University, represents the Western Region on this committee.

The committee held its first meeting August 20-22, 1997 in Raleigh, NC. The meeting was facilitated and 22 discussion items surfaced as being important to the group. A summary of the minutes from this meeting was sent to all state soil scientists and I assume these were shared with you. I won't attempt to list and discuss all 22 items, but I would like to emphasize a few:

- Quality control and associated responsibilities as related to MLRA operations;
- Consider a new definition for soil volume, greater than 2 meters;
- Communications;
- University department heads and deans need to be better informed on NCSS;
- Renew efforts to formalize connections to specific groups;
- Accessibility of databases to cooperators (NASIS, plants, etc.);
- Publications (formats; electronic versus hardcopy, etc.);
- Leadership/MLRA management operations (Steering Teams, etc.);
- MOUs for MLRAs need to be signed;
- RFPs need to be continued;
- Correlation tours; special field trips; and
- How do we perpetuate our science with new students?

At the meeting, we grouped the 22 discussion items and divided them among four breakout groups for discussion purposes. An action register has been developed to help us keep track of the status and progress made addressing the recommendations of the four breakout groups. We will issue periodic updates on the status of these recommendations.

I am very proud of the work of this committee and believe its recommendations will be extremely useful to me as I go about implementing the policies of the Agency and providing leadership for the Federal part of the NCSS.

At the national level, we are also placing special emphasis on the following initiatives:

- Data representing deep investigations below 2m will be included in updated soil survey information;
- Continue to support the Agency's global change and carbon sequestration efforts;
- Support standards for site-specific management as related to soil survey;
- Provide soil survey information to customers in several formats via hardcopy, CD ROM, and the Internet;
- Emphasize soil survey work in urban areas and on Tribal lands; and
- Establish super MLRA project offices that will include an interdisciplinary staff and cutting-edge technology.

Thank you again for allowing me to be a part of your conference. I'm sorry that I will not be able to be with you for the entire week. Have a great conference.

The following information is taken from a PowerPoint presentation.

Natural Resource Inventory & Monitoring Program

Gary L. Williams
Servicewide Program Manager

Natural Resource Information Division
National Park Service
Fort Collins, Colorado

Program Goals

Complete Resource Inventories
Develop Ecological Monitoring Expertise
Implement GIS and Information Systems
Integrate with Park Planning and Interpretation
Form Partnerships

Current Program Status

4 FTE's
Budget
--$6.2 Million (WASO)
--$1.5 Million (Park Base)
--$2.1 Million (BRD)
256 I & M Park Units
505 Park Inventory Projects Funded
7 Prototype Programs Initiated

Baseline Resource Inventories

Goal: To complete a basic set of natural resource information needed for park management and resource protection in approximately 250 park units.

Base Line Resource Inventories

- ♦ Initiated Projects
- ♦ Species Lists
- ♦ Bibliographies
- ♦ Base Cartography
- ♦ Vegetation
- ♦ Water Quality
- ♦ Soils
- ♦ Geology

Base Line Resource Inventories

Scheduled Projects

- ♦ Species Surveys and Distribution
  --Vascular Plants
  --Vertebrates
- ♦ Air Quality
- ♦ Climatic Data

Soils Project

Standard Product Order 3 Survey

--1:24,000 scale

Survey of NRCS data for all 50 states
--124 parks already mapped
--47 parks mapped and digitized

Current mapping projects in 30 parks

Completed and Ongoing Soils Projects

Gateway	Dinosaur
Rocky Mt.	Theodore Roosevelt
St. Croix	Delaware Water Gap
Yosemite	Denali
John Day Fossil Beds	Lake Mead
Bighorn Canyon	Apostle Islands
Hawaii Volcanoes	Death Valley
Santa Monica Mts	Great Smoky Mts
Hagerman Fossil Beds	C&O Canal
Pecos	Joshua Tree
New Mexico Cluster	Arizona Cluster

FY 1999 Efforts

Hire Soils Scientist
Initiate Digitizing of Existing Maps

New Projects:
-- Crater Lake
-- Channel Islands
-- Glacier

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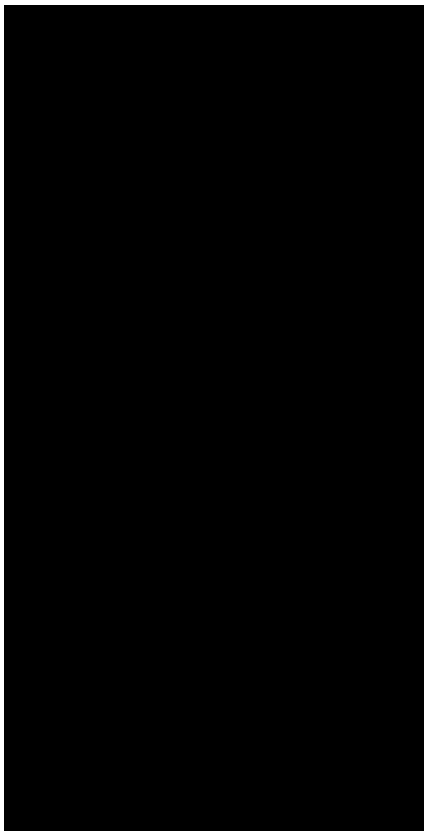
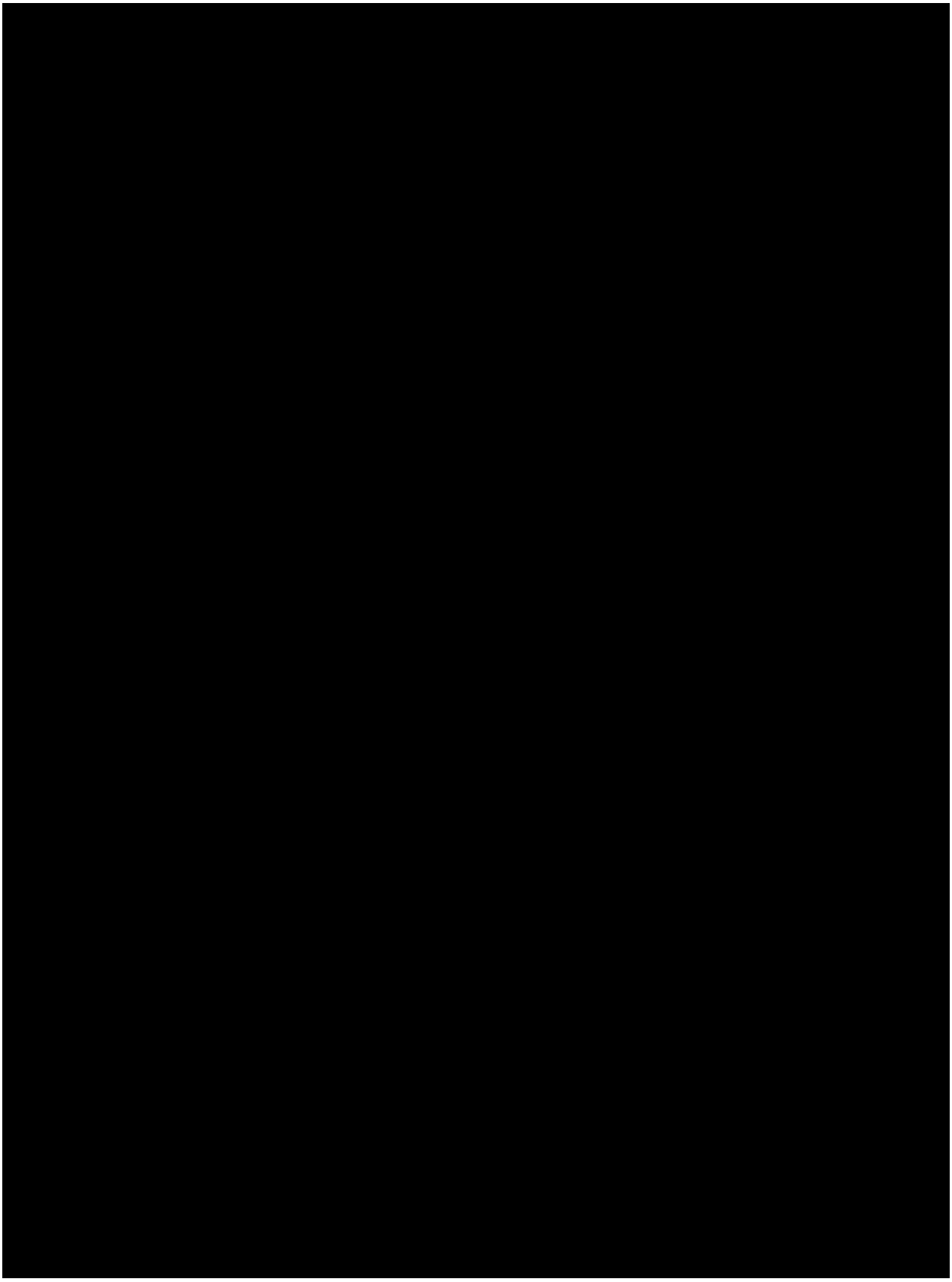
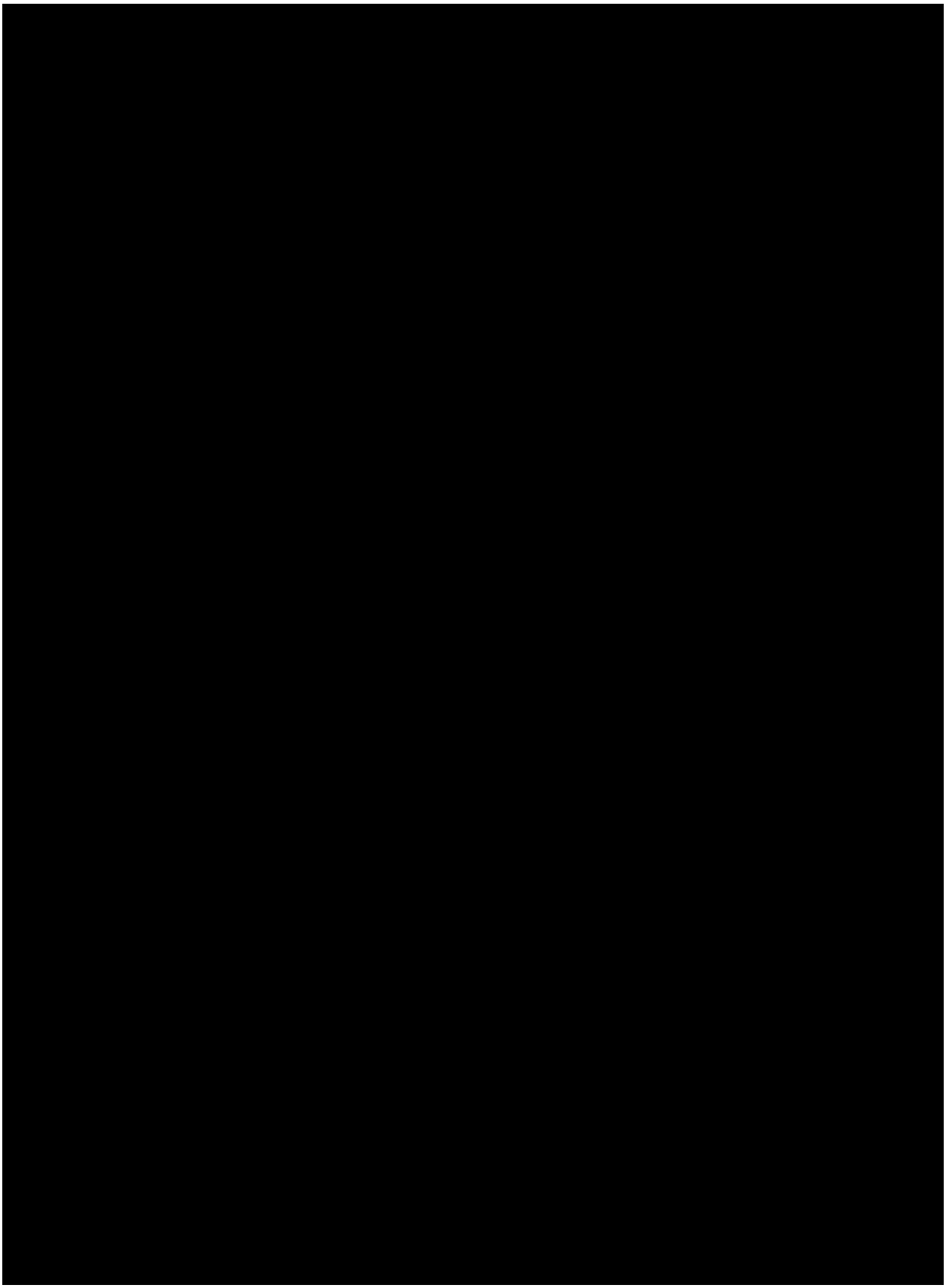


Agency Breakout





Soil Survey-related Activities at Washington State University

The state general soil map is in final edit and soon to be sent out for printing. A web version is also under construction and will be shown at this meeting.

Studies have been conducted to determine a dustiness index for soils in eastern Washington that are suspected of emitting particulate matter less that 10 pm in diameter (PM-10). A resuspension chamber was used to examine samples in the laboratory. Samples from the eastern plateau emitted 0.9% of starting mass as PM-10 in a 1-hour experiment; samples from the southwestern plateau emitted less than 0.1% of starting mass as PM-10. Differences are related to particle size distribution of the loessial soils and degree of aggregation by clays and organic matter.

A study has been initiated to model the occurrence of soil properties in wilderness areas. A GIS is being developed to facilitate the spatial modeling effort. Study areas are the Sawtooth and Pasayten Wilderness areas. ARC/INFO is the modeling platform and results are verified through aerial photo interpretation and site visits. Preliminary use of slope, aspect, and parent material provides a broad-scalestratification of the landscape according to textural divisions.

Number: WCC-93

TITLE: Western Region Soil Survey and Inventory

DURATION: October 1, 1996-September 30, 1999

DESCRIPTION AND JUSTIFICATION:

The National Cooperative Soil Survey (NCSS) is a federal and state partnership charged with the survey and inventory of soil resources in the United States and its territories. All surveys conducted under NCSS must adhere to strict standards of quality and scope. Federal cooperators include personnel from the USDA Natural Resources Conservation Service, USDA Forest Service, and USDI Bureau of Land Management. State cooperators include soil scientists from Agricultural Experiment Stations involved in soil survey and pedological research (soil genesis, classification, morphology, interpretation, mineralogy, etc.).

Historically, Experiment Station cooperators have been involved in almost all aspects of soil survey. Currently, Experiment Stations are subject to increasing funding constraints, increasing demands for research productivity and securement of external grant funds, while still committed to providing quality soil survey, interpretations, and research assistance to the NCSS. At the same time, federal agencies involved in NCSS are subject to limited funds, organizational restructuring, and a changing clientele demanding new surveys and expanded data interpretation oriented toward ecosystem management and environmental quality.

Western Regional Coordinating Committee-93 and its predecessor, WRCC-30, has provided opportunity for western Experiment Station cooperators to meet with leaders of the NCSS in the western region and coordinate regional activities consistent with the goals of NCSS. Because of changing demands on all NCSS cooperators, continuation of WCC-93 is essential for providing opportunity for Experiment Station personnel to be actively involved in planning of NCSS activities and coordination of research consistent with the goals of NCSS.

Soils and ecosystems in the western region are unique, e.g., high elevation, volcanic, and arid/semiarid soils and ecosystems. Development of successful survey, inventory, and management strategies requires research conducted specifically in ecosystems unique to this region. Many of these unique ecosystems occur on lands managed by less traditional cooperators in NCSS, such as the Forest Service and Bureau of Land Management. Coordination of research consistent with NCSS goals must include these less traditional cooperators.

Coordination of research activities via WCC-93 is essential for Experiment Station cooperators to fulfill their commitments to NCSS in the west. Because each western state Experiment Station has so few personnel actively involved in soil survey, and the distances between personnel are so great, it is critical that this committee be renewed to provide continued opportunities for regional coordination of activities related to soil survey.

OBJECTIVES:

1. To evaluate the effectiveness of current mechanisms and to develop more effective and efficient mechanisms for direct input from the Agricultural Experiment Stations into the National Cooperative Soil Survey (NCSS).

2. To coordinate pedologic research activities in soils and ecosystems unique to the western region (i.e., properties and processes of volcanic soils; influence of soil and weathered rock on water quality and

supply; role of soils in understanding the history, function, and degradation of arid, semiarid, and high elevation ecosystems; etc.).

3. To coordinate research programs that will benefit NCSS goals of soil survey and ecosystem management in the western region.

4. To identify and directly involve less traditional NCSS cooperators in western regional research related to soil survey and ecosystem management, specifically NCSS cooperators from USDA Forest Service and USDI Bureau of Land Management.

5. To continue representation of Agricultural Experiment Station pedologists in the National Cooperative Soil Survey at regional and national work planning conferences.

EXPECTED OUTCOMES:

Research programs that facilitate the survey, inventory, and management of sods and ecosystems unique to the western region will be coordinated. Research on critical ecosystems and specific geographic areas will be identified and prioritized.

Involvement in NCSS via participation in regional and national soil survey work planning conferences will continue. Less traditional cooperators in research and research coordination will be identified.

Comparison of NCSS goals and cooperator resources in the western region will lead to more efficient use of NCSS personnel in soil survey, inventory, management, and research activities.

EDUCATIONAL PLAN:
Participation of WCC-93 members at regional and national work planning conferences in strategic committees and in technology transfer will result in education of NCSS cooperators. Strategies and joint research will be published in regional newsletters (i.e., Pedon News, published by the Bureau of Land Management) and other publication outlets.

PARTICIPANTS:

C. L. Ping*	U. of Alaska	Soil Genesis and Classification
D. M. Hendricks*	U. of Arizona	Mineralogy, Micromorphology and Genesis
R. G. Amundson*	U. California - Berkley	Pedology
R. J. Southard*	U. California - Davis	Pedology
R. C. Graham*	U. California - Riverside	Soil Mineralogy, Pedology
E. F. Kelly*	Colorado State Univ.	Pedology
P. A. McDaniel*	U. of Idaho	Pedology
Gerald A. Nielsen*	Montana State University	Pedology
H. Curtis Monger*	New Mexico State. Univ.	Pedology
H. Huddleston*	Oregon State Univ.	Wet Soils, Soil Interpretations
J. Boettinger*	Utah. State Univ.	Pedology, Soil Mineralogy
A. J. Busacca*	Washington State Univ.	Soil Morphology, Genesis, Classification

*Voting members

OPERATIONAL STRUCTURE

The secretary of the committee is selected by the participants at the biannual regional NCSS meeting. After serving a two-year term as secretary, the secretary moves into the committee chair position. Committee members rotate through the chair and secretary, insuring full regional representation. Regional representatives to national NCSS committees (i.e., Soil Survey Standards Committee, National Soil Survey Laboratory Committee, etc.) are selected by committee participants at annual or biannual meetings as necessary. The chair is responsible for organizing and presiding over each meeting. The secretary records minutes of the meetings, updates information on all participants, and collects reports from individual participants for inclusion with the minutes and evaluation report to the Western Association of Agricultural Experiment Station Directors.

SIGNATURES:

Administrative Advisor	Date
Co-Administrative Advisor	Date
Chair, Western Directors Association	Date

WCC-93 Petition Renewal

ATTACHMENTS:

ACCOMPLISHMENTS:

Objective 1: Provide a mechanism for direct input from the Experiment Stations into the National Cooperative Soil Survey (NCSS).

The committee met with leaders in the National Cooperative Soil Survey (NCSS) on local (state) and regional levels. Committee members from each state first met with the state cooperators at the local cooperative soil survey planning meeting. The concerns and issues that arose during the local meetings were brought to the regional cooperative soil survey conference in 1994. Committee members participated in the discussion and resolution of these issues as members, and, for a few committee members, as chairs of the working committees. These working committees identified and developed strategic planning initiatives crucial to the success of NCSS. The committees at the 1994 regional work planning conference were 1) Role of the NCSS in site specific soil surveys; 2) Drastically disturbed soils; 3) Ecosystem-based soil surveys for resource planning; 4) Distribution and access to soil survey data; 5) Redefining the cooperative role in NCSS; and 6) New ways of making soil survey interpretations. A regional representative participated in the national soil survey work planning conferences in 1993 and 1995.

Objective 2: To allow for coordination of research activities and distribution of research results directly to NCSS.

Committee members have been actively involved in technology transfer at both the local and regional levels. Committee members often attend soil survey field reviews within their states, and are also involved in presenting research results and implications for sod survey to NCSS leaders at the regional work planning conferences.

Objective 3: To coordinate research programs to meet the specific needs of NCSS.

The Agency NCSS representatives had broad opportunities to provide input into needed research. In many instances, the NCSS cooperators did joint research. Committee members have been involved in research with NCSS cooperators from the Natural Resources Conservation Service, Forest Service, and Bureau of Land Management. Local and regional meetings and field reviews provide opportunities for cooperators to have input to research planning and implementation.

Objective 4: Allow the university researchers involved in soil genesis the opportunity to meet with representatives of other agencies in the NCSS to assess current and future needs in research to support soil survey programs.

All committee members met together to report on recent research activities related to local, regional, or national NCSS activities. These meetings were held in conjunction with the 1994 regional NCSS work planning conference (FY 1994) and the 1994 Soil Science Society of America Meeting (FY 1995). A similar meeting is planned in conjunction with the 1996 regional NCSS work planning conference, along with participation in strategic planning committee work as described above. Several regional cooperative projects between committee members have been initiated at these meetings.

Objective 5: Allow for continued representation of all Agricultural Experiment Stations in the National Cooperative Soil Survey at regional and national work planning conferences.

Members of WCC-093 are voting members of the Western Soil Survey NCSS Conference. These representatives set the direction of the soil survey and soil survey based land use planning in the region.

PRINCIPAL INVESTIGATOR CONTRIBUTION TO WCC:

Please see attached original of each participant' s form.

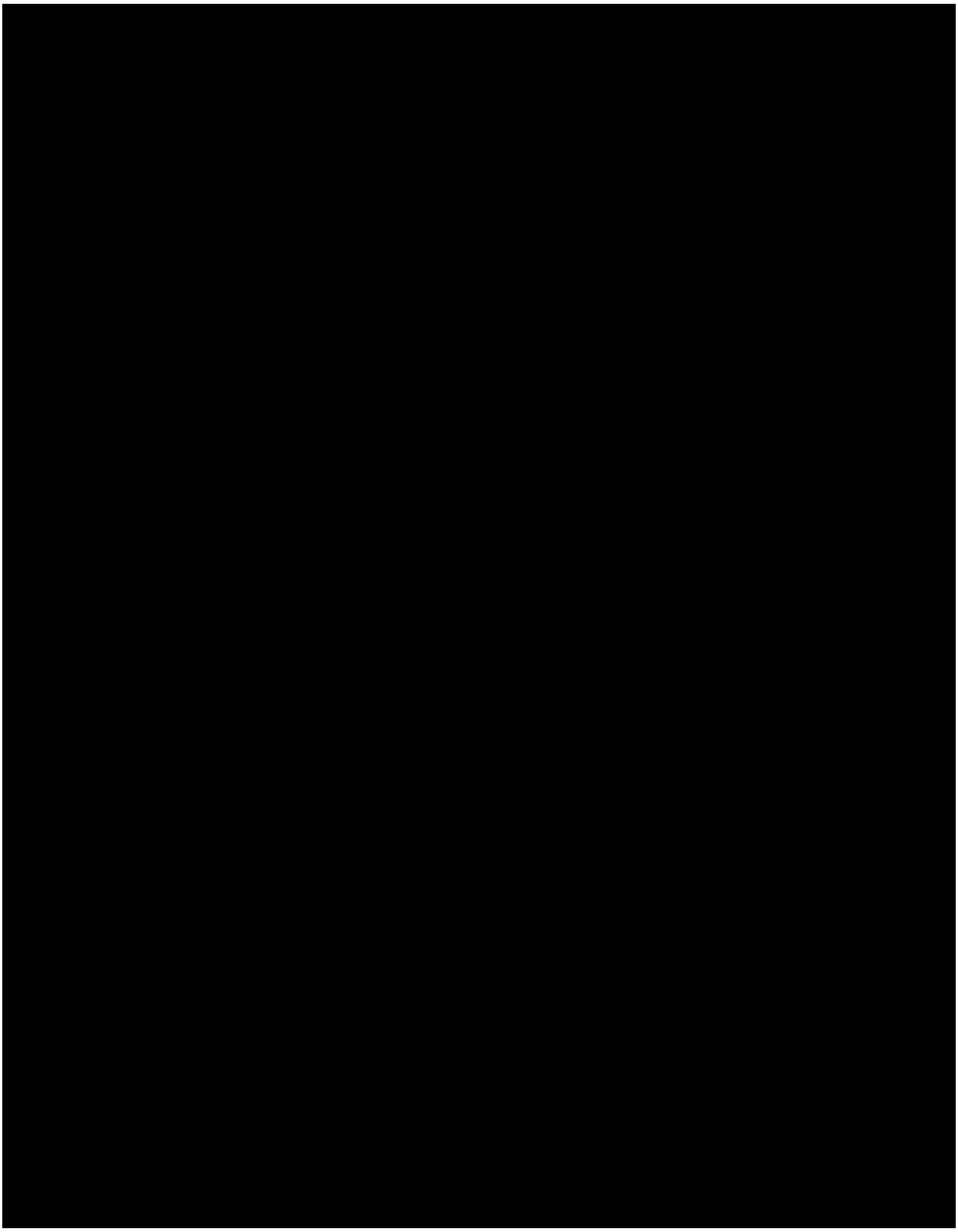
Washington State Soils Website

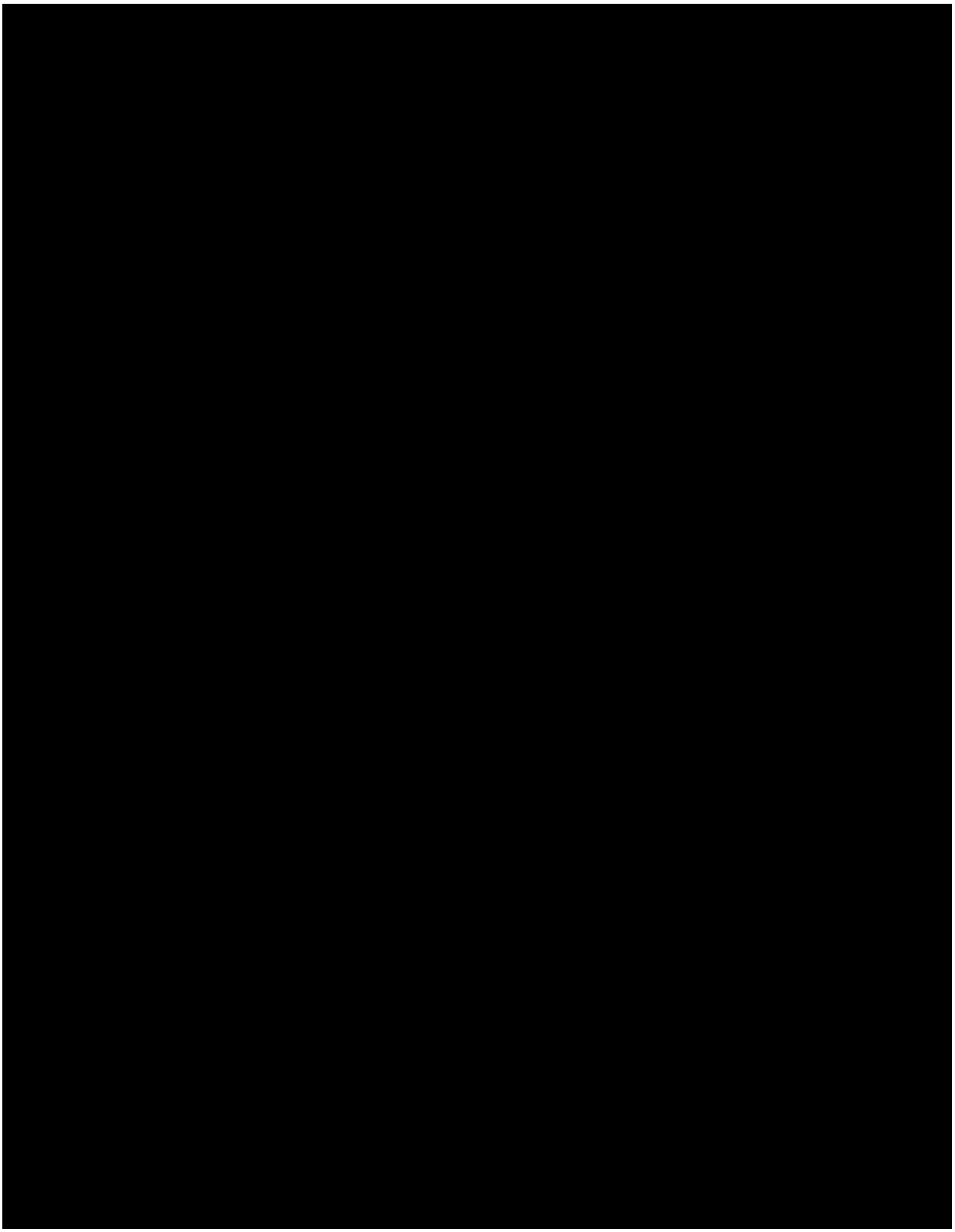
Maureen Boling, Bruce Frazier and Alan Busacca created the soil map. Their map was digitized by the Spokane Office of the NRCS, and provided as an ArcView© export file. This file was brought into ArcView© where county boundaries, cities and color were added. This state map was exported as a bitmap, converted to a GIF file with Microsoft Image Composer©, and is used on the initial page of the website. Soils in individual or groups of counties were selected from the original soil map in ArcView©. The county soil maps were exported as bitmaps to Microsoft Paint© to be colored, and then converted to GIF files as above.

The descriptive characteristics were, put into a Microsoft Access© database that was imported into ArcView© and joined to the map database. The joined database was exported as a DBF file, passed through Microsoft Excel© to solve a file compatibility problem, and imported into Access©. The database was reduced in size from one record for each soil polygon to one record for each soil legend category. Individual reports were created for each soil legend category and converted into HTML files.

The webpages were assembled using Microsoft FrontPage98©. The county soil map GIF images were placed on a page and drawing a polygon around an individual map unit created client-side image maps. Where one soil map unit was embedded in the middle of another, the surrounding map unit was split into two or more polygons. The targets for the image map polygons were assigned to the soil description files. Finally, the soil series examples in the soil description files were hyperlinked to their detailed descriptions in the Soil Series Classification database maintained on the web at Iowa State University.

Future modifications will include the addition of images of landscapes and soil profiles. The map itself will be modified to become more interactive with the addition of panning and scaling controls.





The BLM Soils Activities - Presented at the Western Regional Cooperative Soil Survey Conference Albuquerque, New Mexico, June 15,1998

Prepared for BLM Headquarters by Scott Davis, State Soil Scientist, Colorado

The BLM oversees more than 264 million acres of public lands, mostly in the West. It is also responsible for managing oil, gas, and solid minerals on more than 570 million subsurface acres. BLM has over 9,000 employees. Todays' priorities include implementing the Clean Water Act Initiative, riparian restoration, abandoned mine land clean-up, land exchanges & transfers, noxious weed management, the Pacific Northwest Forest Plan, and the Columbian Basin Plan, to name a few. The Grand Staircase-Escalante National Monument is another example of BLM building on its experience in collaborative stewardship. Other issues of importance are managing wild horses & burros, re-introduction of fire, emergency fire rehabilitation, the transfer of the Naval Oil Shale Reserve in western Colorado, finalizing the integrated activity Environmental Impact statement (EIS) for the National Petroleum Reserve, Alaska, completing mineral exams & reports for pending patent applications, and revising the surface mining regulations.

In an average day, the BLM collects $750,000 from forest and mineral sales, grazing leases, and other uses of the public land. The mineral leases alone which BLM administers generate over $4.4 million in revenue each day. Up to a half of these monies goes back to the states & local communities. The BLM also issues hundreds of permits daily for recreational activities, wood gathering, Christmas tree cutting, special forest products, etc. We assist and educate visitors about historic and cultural values at 46 interpretive sites and visitor centers, such as the Oregon Trail Visitor Center at Baker City, Oregon and the Anasazi Heritage Center at Delores, Colorado.

An average of 180,000 people occupy BLM camping facilities on a given day. The BLM issues 12 rights-of-way applications each day to allow community services such as telephone lines, electric transmission, pipelines, timber & mining work, etc. to go across public lands. We inspect oil and gas operations on 300 leases each day, ensuring environmental health and safety and that rents and royalties are paid to the General Treasury.

Soils information and the soil survey has been valued at $5 billion nationwide. The soil information is the foundation for the BLM activities and serves as a guide for land use decisions. The BLM employed 122 soils scientists in the early 1980's -- the Soil Vegetative Inventory Method (SVIM) being the driving force for doing EIS's on public grazing lands. Today, the number of soil scientists is 34, with many soil experts working in riparian/watershed, hazardous materials, and surface reclamation activities.

Western Regional Cooperative Soil Survey Conference
June 15, 1998

Agency Report

Bob Hetzler, Area Soil Scientist
U.S. Bureau of Indian Affairs
Phoenix Area Office

Soil Survey Needs

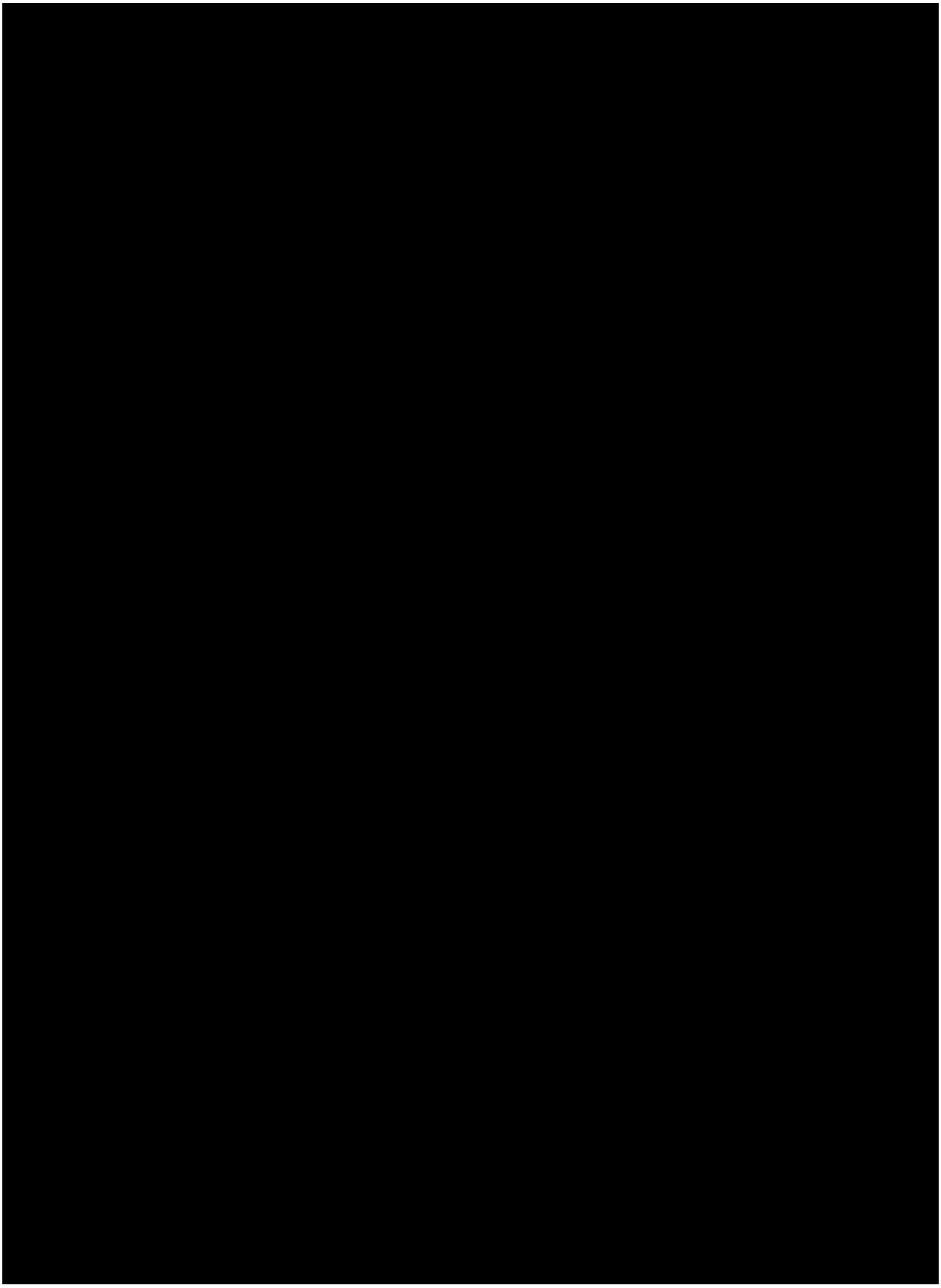
Seventy seven percent of the 12.7 million acres in the Phoenix Area have been mapped to NCSS standards. The twenty three percent remaining is represented by two large reservations, the San Carlos Apache Reservation in Arizona and the Uintah and Ouray Ute Reservation in Utah. The NRCS, in cooperation with the Tribe and BIA has initiated the San Carlos sod survey (SSA 675). Consultation has started with the U&O Agency and the Ute Tribe for a NCSS on the Uintah and Ouray Reservation. Coordination with the NRCS, Hopi Tribe, and Hopi Agency has also started on mapping Hopi lands as part of SSA 707, Little Colorado River Area, Arizona. The White Mountain Apache Tribe has expressed an interest in updating the Soil Survey of Fort Apache Indian Reservation, Arizona (SSA 683).

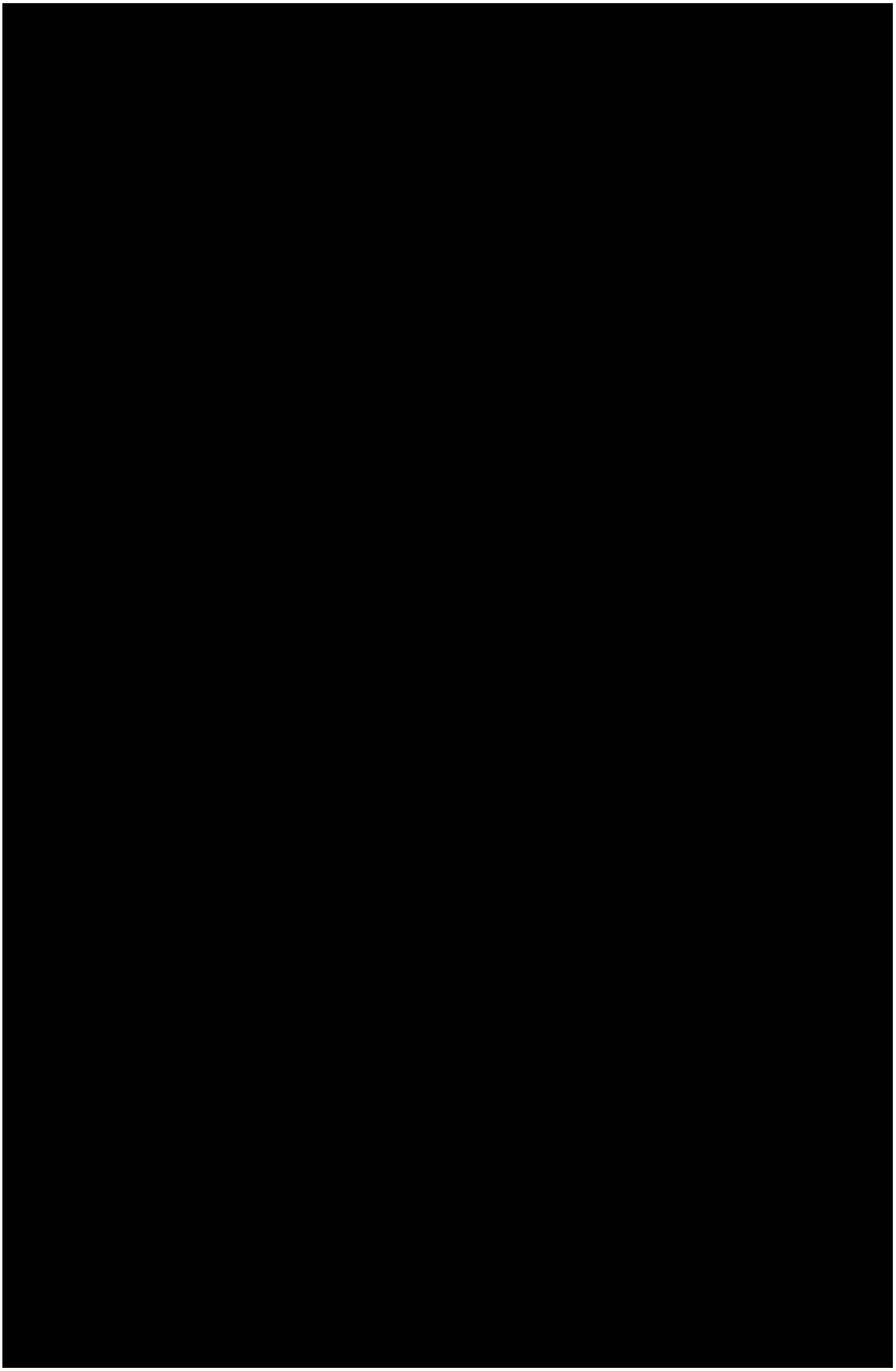
Soil Quality Assessments

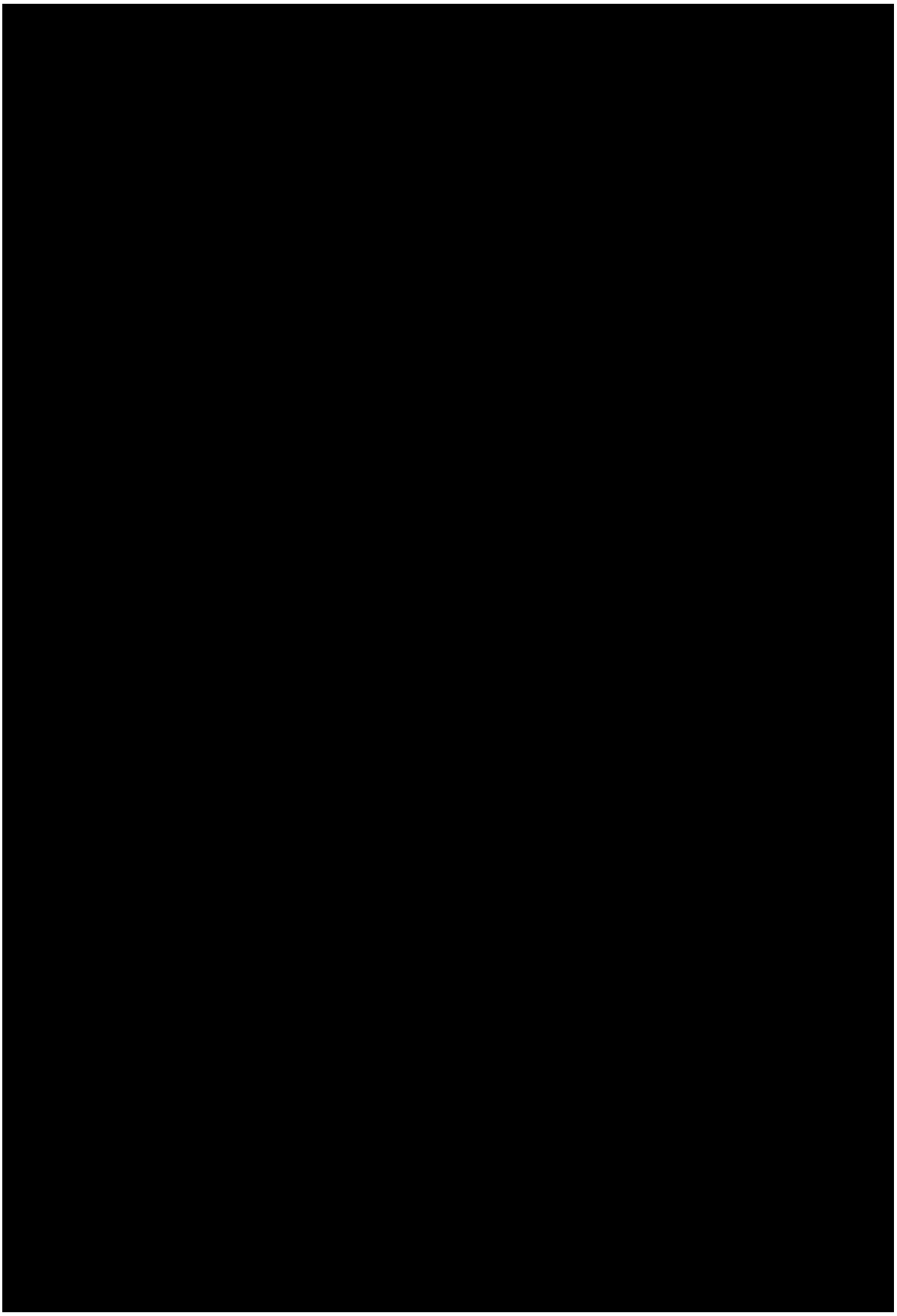
Currently in the Phoenix Area, there is no programmatic method of assessing or monitoring soil quality or condition. Soil quality is only inferred from other conditions or events (i.e., range condition, erosion). The bureau is particularly interested in soils response to rangeland management, as grazing accounts for 90% of Indian land use. Soil capability and soil condition should be factored into land management decisions. First, a baseline assessment is needed. For reservations without a soil survey, soil quality assessment could be incorporated into soil survey activities, but published separately**.** For reservations with soil surveys, additional data collect may be necessary. Criteria and sampling protocols for rangeland, cropland, and woodlands need to be developed or adapted for each area.

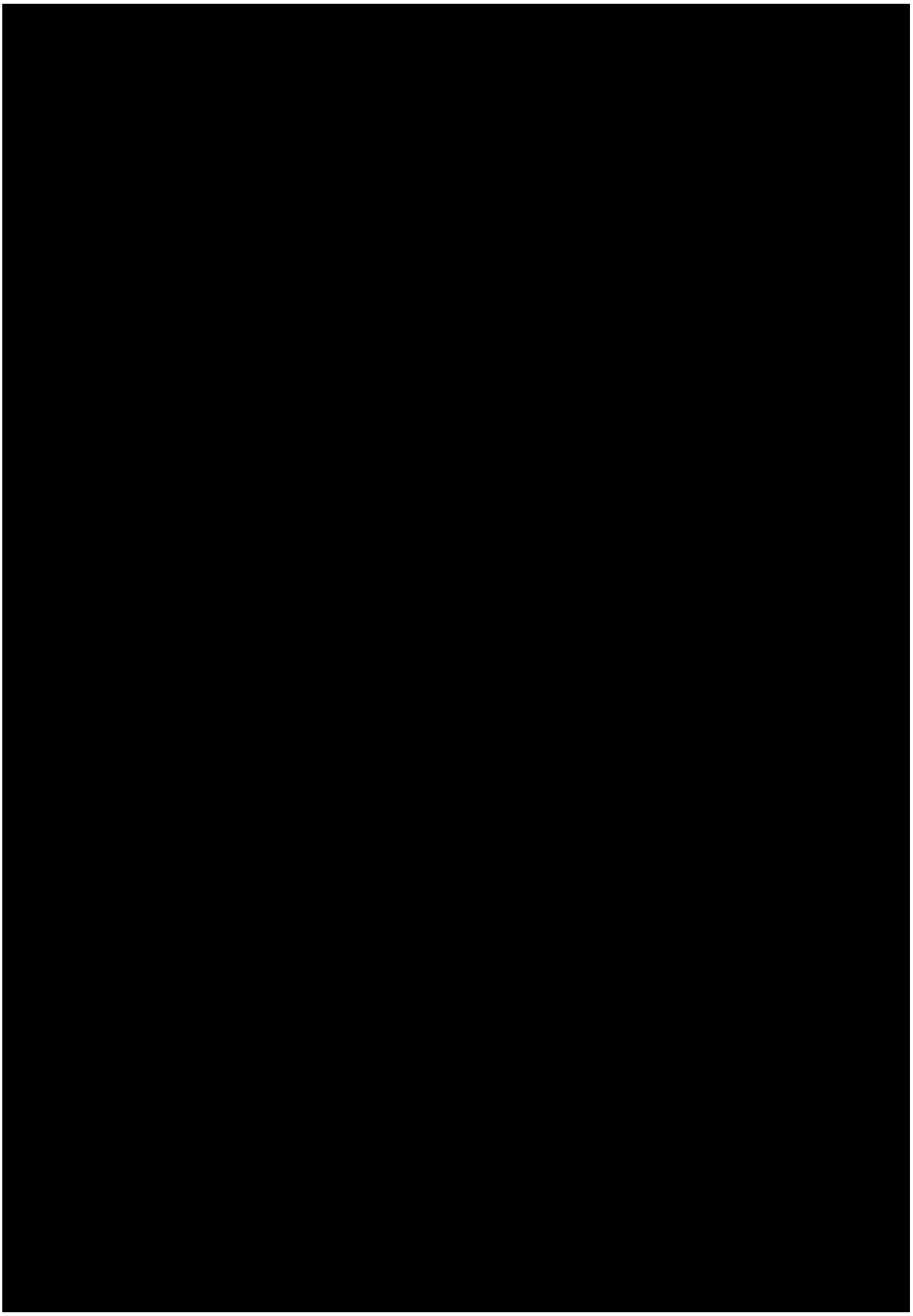
Digital Data Highlights

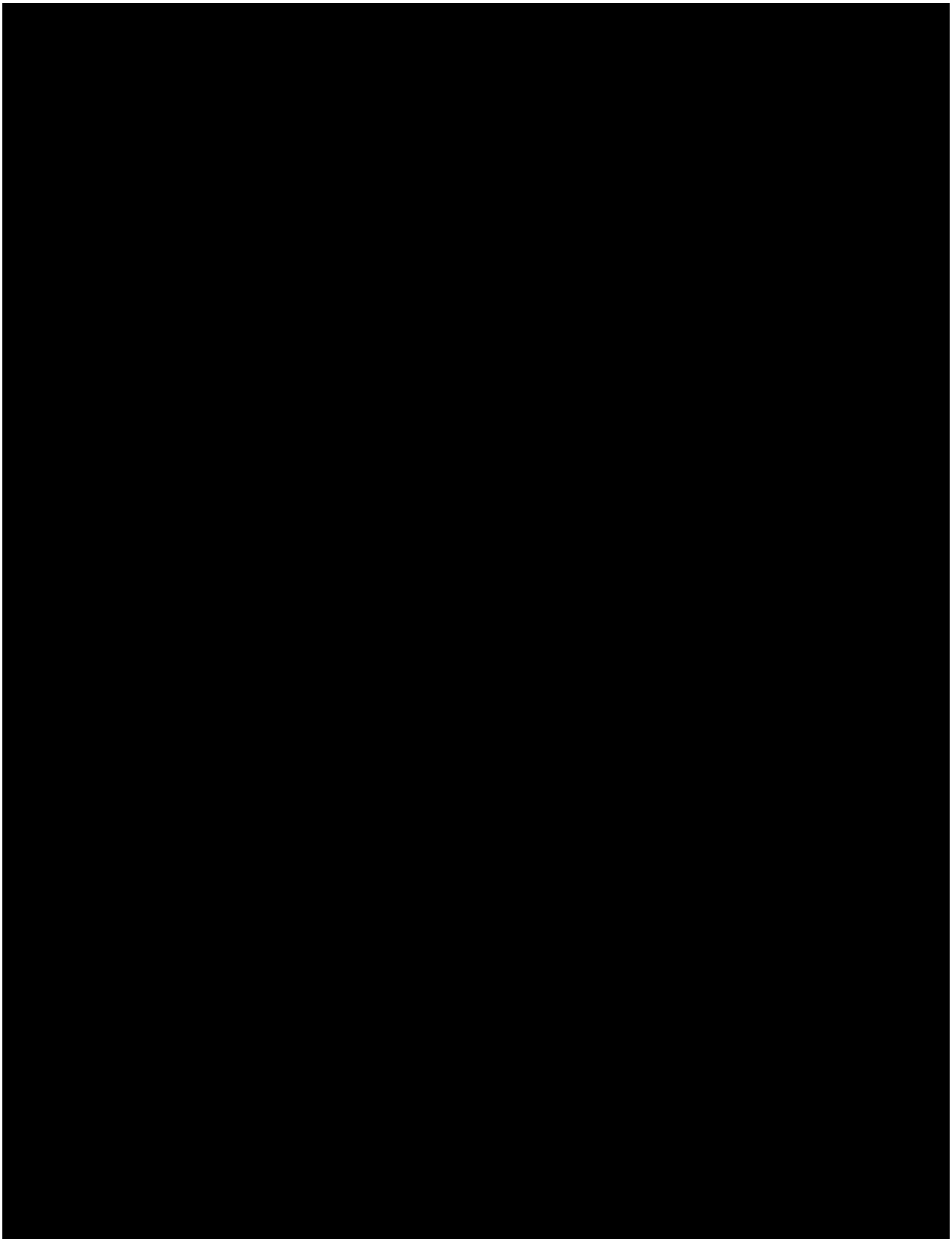
Tribal and bureau natural resource specialist have received ArcView3 training and are using SSURGO data, where available, or, the digitized soil layer with our existing geospatial datasets. Everyone using SSURGO, is impressed with the amount of soils data available at their computer fingertips.

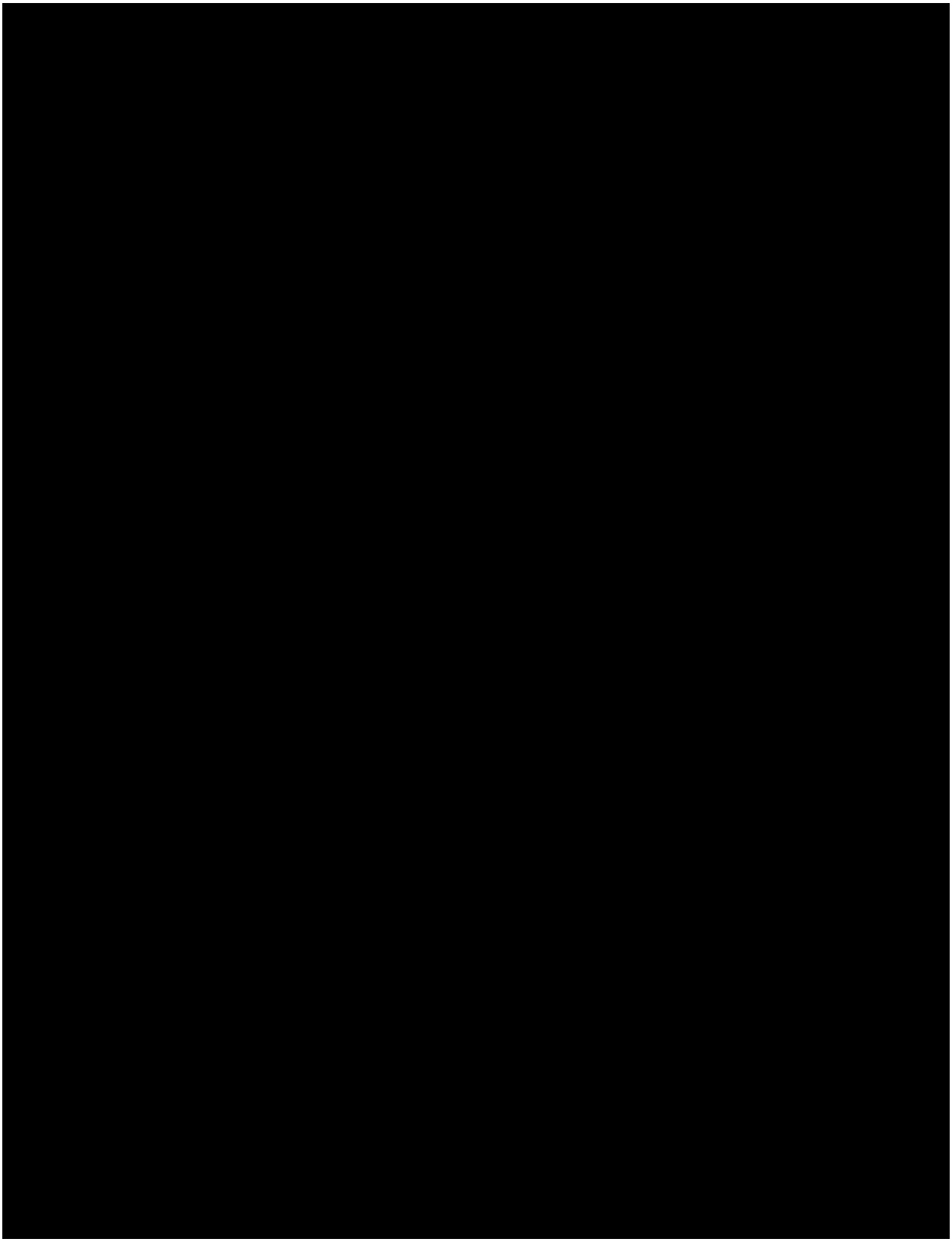


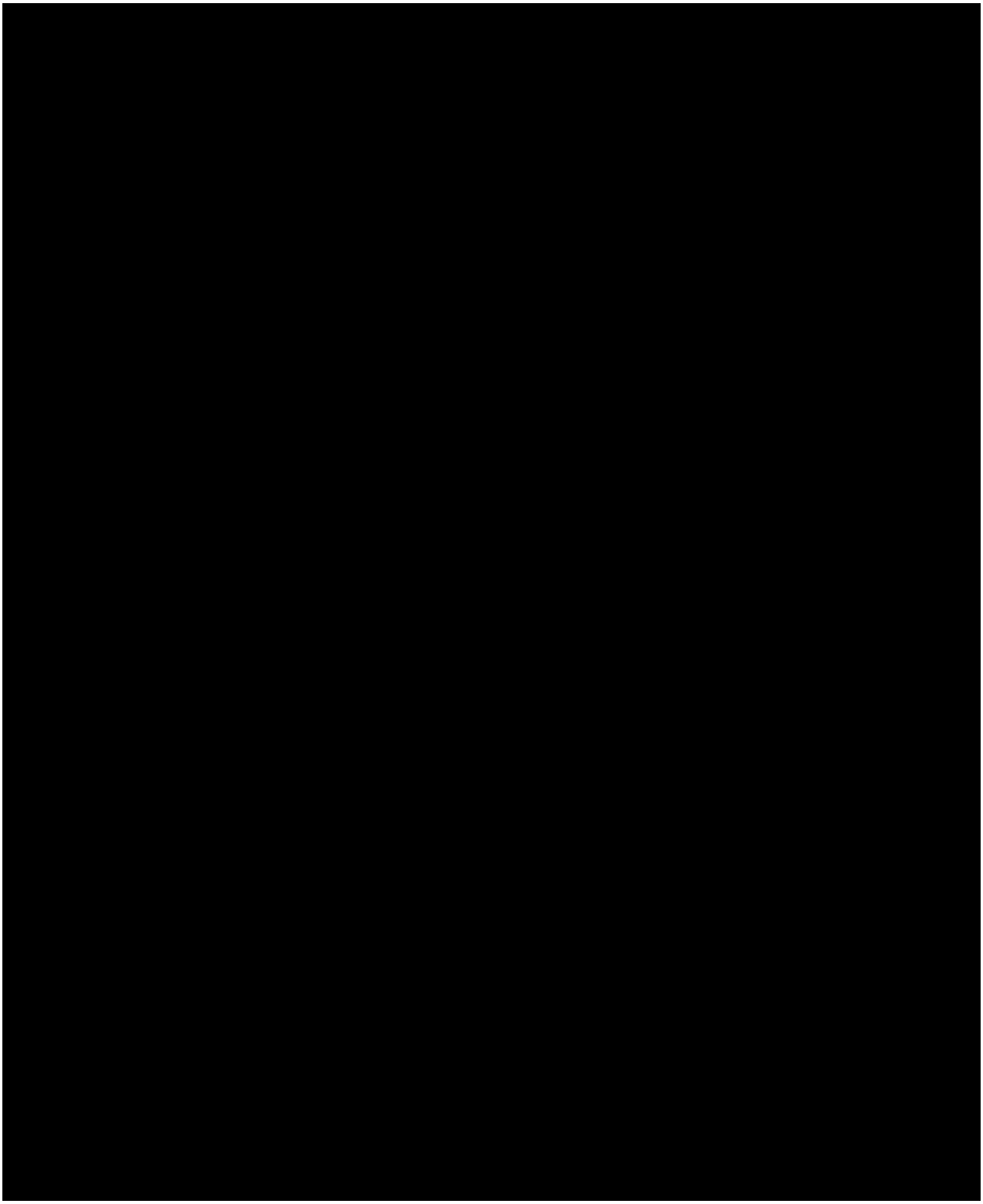


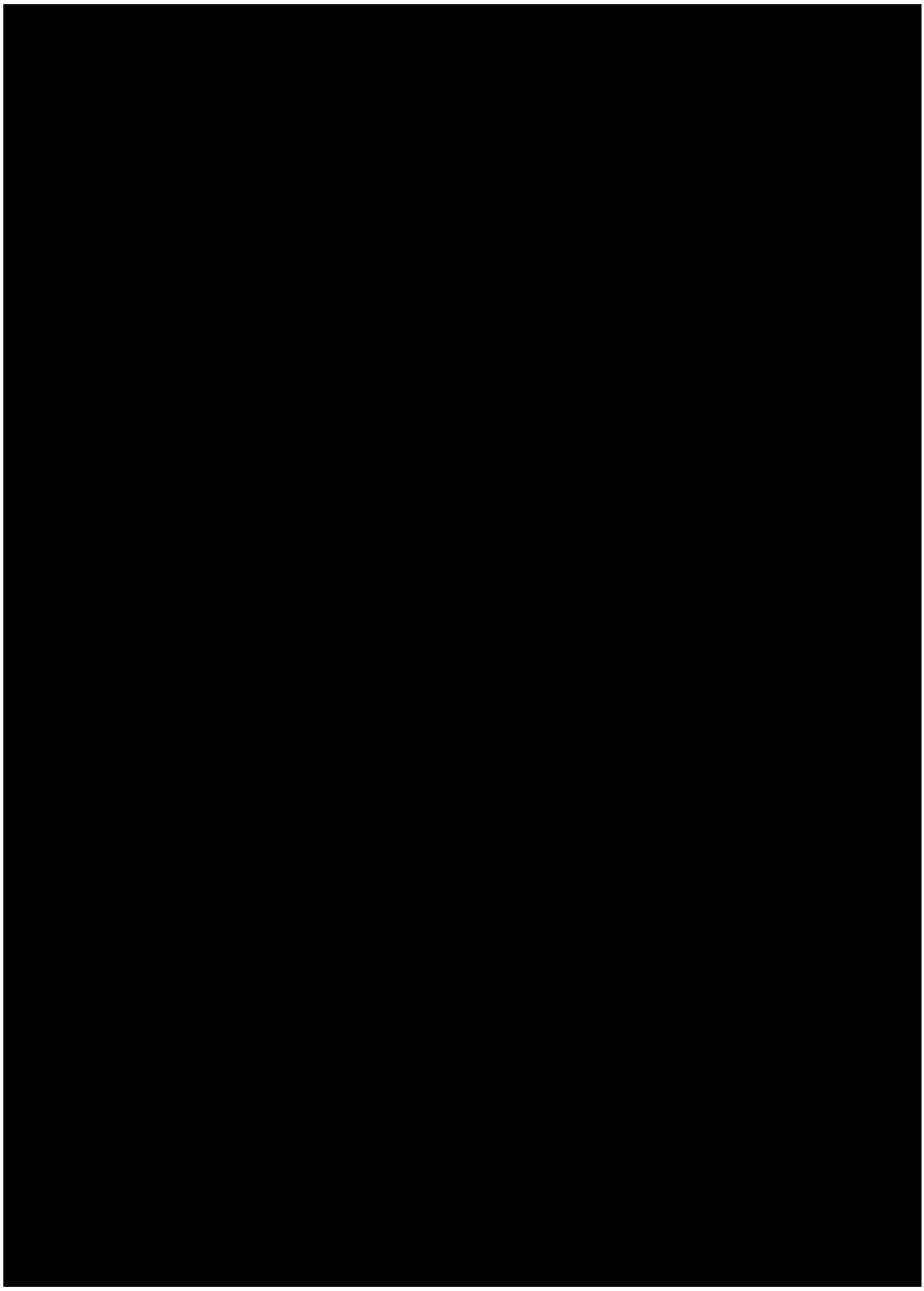












WESTERN REGIONAL CONFERENCE
National Cooperative Soil Survey

Agency Break Out Session

Natural Resources Conservation Service
Monday, June 15,1998 - Albuquerque, NM

MLRA Leader Report -
for the
PHOENIX MAJOR LAND RESOURCE AREA OFFICE (M08)
SOUTHWESTERN BASIN, RANGE, MOUNTAIN AND PLATEAU REGION

Listed below, are the major "Quality Assurance" activities undertaken or currently in progress within MO8. For the sake of time and to lessen the repeat of activities to be reported by the States serviced by the MO8 office (AZ, CA, CO, NM, TX & UT), only these "keynote" items are reported:

1. New surveys initiated:
   Ute Mountain Area, Colorado
   Presidio County Area, Texas
   Fort Bliss Military Reservation, New Mexico (DOD)
   Grand Canyon Area, Arizona (NPS)

2. Final Field Review/Correlation's:
   Cortez Area, Colorado
   San Bernardino Interim (part of Cochise Co., Douglas-Tombstone Part)

3. MLRA MOUs in various stages of draft:
   MLRA 35 - Colorado and Green River Plateaus
   MLRA 42 - Southern Desertic Basins, Plains, and Mountains
   MLRA 40 - Sonoran Basin and Range

4. Ongoing MLRA boundAU studies:
   MLRA 35 - predominantly along the AZ/NM border - currently have 2 proposals circulated for comments.
   MLRA 30/40 - a review of existing proposal from the early 1990s, that reflects/estimates the boundary between the Mohave and Sonoran deserts in southern California.

5. Maintaining NASIS capabilities:
   M08 has placed an order for an HP NASIS computer delivery 7/1/98(?).
   Existing SUN computer has limited life expectancy.
   All SSA databases within M08 have been converted to NASIS 3.1 and are currently stored on the Phoenix MO8 server.

Oregon Soil Survey Program

Currently there are 4 progressive first time soil surveys in Oregon staffed by NRCS soil scientists. There also is 1 MLRA update soil survey in progress in the Willamette Valley. We will soon have all of the surveys digitized in the Willamette Valley update area and plan to have the geology and geomorphic surfaces digitized for use in the update. We are also in the process of trying to obtain 10-meter DEM data for use in the update. We are currently working on a reimbursable soil survey of the John Day Fossil Beds National Monument for the National Park Service. The U.S. Forest Service has a progressive soil survey in the Blue Mountain Area of eastern and central Oregon. The USFS has recently hired a project leader for the Winema National Forest and will be starting a progressive survey there.

Oregon has 12 SSURGO certified surveys with 5 more in the final stages of certification by the digitizing unit. We will request funding to digitize and certify the last 3 completed soil surveys in Oregon in FY99. We have held 2 training sessions to introduce users to the SSURGO data. These sessions have been very well attended and we have received many good comments about them. We plan to hold more of these training sessions as more of the state is covered by SSURGO certified soil surveys.

Dr. Herb Huddleston is continuing his study of wet soils under the Global Climate Change Initiative. This study has provided very valuable information in the development and testing of the hydric soil indicators.

Oregon is taking part in the Soil Explorer Program to put a soil survey on CD-ROM. Lincoln County has been chosen which is one of the counties that borders the Pacific Ocean. We plan on participating with the Hatfield Marine Science Center in Newport, Oregon to have a kiosk with a computer to provide access to the CD as a marketing tool.

Portland MO

There are currently 16 NRCS and 3 Forest Service surveys in progress within the MO area of responsibility. There are also 4 MLRA update and maintenance projects in progress.

We started with a backlog of 20 soil survey manuscripts. We have completed the technical edit on 5 of those. The English edit has been completed on 3 soil survey manuscripts for the Portland MO and on 2 for the Reno MO. The formatting of these manuscripts is in progress and they should be ready to submit for publication hopefully by the end of the fiscal year or at the latest the end of the calendar year.

Two people from the MO have attended the digital map finishing training. They are currently working digital map finishing of two surveys. We hope to have these two surveys finished by the end of the fiscal year.

All surveys in the MO area of responsibility are in NASIS and we are ready to load NASIS 4.0 when it is released. All soil scientists within the MO area of responsibility have had basic NASIS training.

We have also held query writing and report writing training for selected soil scientists. We are planning additional training for resource soil scientists in September in query writing and report writing.

We plan to or have installed Arc/View in three soil survey offices within the MO area of responsibility that are involved in MLRA update soil surveys. We will provide support to these offices so they can use Arc/View with digitized soil surveys and other digital layers in the update process.

Western Regional Conference
National Cooperative Soil Survey
Albuquerque, NM

NEW MEXICO BRIEFING -

Soil Scientist Positions

The number of soil scientist performing soil mapping and technical soil services has declined greatly in the last few years. New Mexico currently has 9 soil scientists onboard. The positions called for in staffing plans and those filled are as follows:

State Office - ASTC/RIA - Ken Scheffe
SDQS- Clarence Chavez
SDQS-VACANT

Resource Areas Specialist
- Albuquerque - Gerald Stratton
- Deb Prevost - on educational leave
- Portales -VACANT
- Las Cruces - VACANT

Clovis (Roosevelt Co) SSO - SSPL - Bob Hill
- Soil Mapper - VACANT

Grants (McKinley Co) SSO - SSPL - Scott Zschetzsche
- Soil Mapper - VACANT

Ft. Bliss SSO (El Paso) - SSPL - Dale Sprankle
- Soil Mapper - Greg Cates
- Soil Mapper - Nelson Rolong (Detailee from TX)
- Soil Mapper- Danny Chavez (Detailee from TX)

Santa Fe SS Update - SSPL - Charles Hibner
- Soil Mapper - VACANT

Soil Survey Program-

Soil Mapping Activities-

Ft. Bliss Soil Survey - DoD Reimbursable Update Project
- 1.15 M. acres; approx. 700,000 ac mapped
- Parts of Dona Ana, Otero Counties NM and El Paso County, TX

McKinley County Area- About 90% complete, >3 million acres
Last NRCS "First Generation" survey in New Mexico

Roosevelt County- MLRA 77 Update, second update survey for New Mexico in MLRA 77 - <5% complete

Santa Fe County Update- Urban needs update,
- Partial City/County Reimbursable
- 500,000+ acres to update

Future Mapping Activities - Planned or Known

National Park Service MOU - Late 1998 start at earliest
- Approximately 115,000 acres
- Reimbursable project

Bandelier National Monument
Chaco Culture National Historical Park
Carlsbad Caverns National Park
Salinas Pueblo Mission National Monument
Ft. Union National Monument
Gila Cliff Dwelling National Monument

Army National Guard MOUs -1998 Start Planned
- Approximately 7,500 acres
- DoD Reimbursable

Santa Fe-Army National Guard Armory Site
Roswell- Army National Guard Armory Site
Cadsbad- Army National Guard Armory Site
Deming - Army National Guard Armory Site

DoD - Army - White Sands Missile Range
- 2+ million acres

DoD USAF - Possibly 3 Air Force Bases-
Kirtland AFB – Albuquerque
Holloman AFB – Alomogordo
Canon AFB - Clovis

Bosque del Apache National Wildlife Refuge- Request for soil mapping on 2,300 acres riparian area

Technical Soil Services-

Field Office Soils Training- Making plans to update soils skills of NRCS field staff

Database Developments (NASIS)

Conversion Status- All survey areas converted. Will access NASIS via Phoenix, Lakewood, Temple.

Shiprock Soil Survey Manuscript- Reviewed by MO 8 staff

- Being reviewed by Charles Hibner

Guadalupe Soil Survey Manuscript- Being reviewed in Texas

SSURGO Development- New Mexico is participating in 17 current SSURGO projects. To date, Union County is the only to be certified. Approximately 30% of New Mexico has digital capture of soils layer.

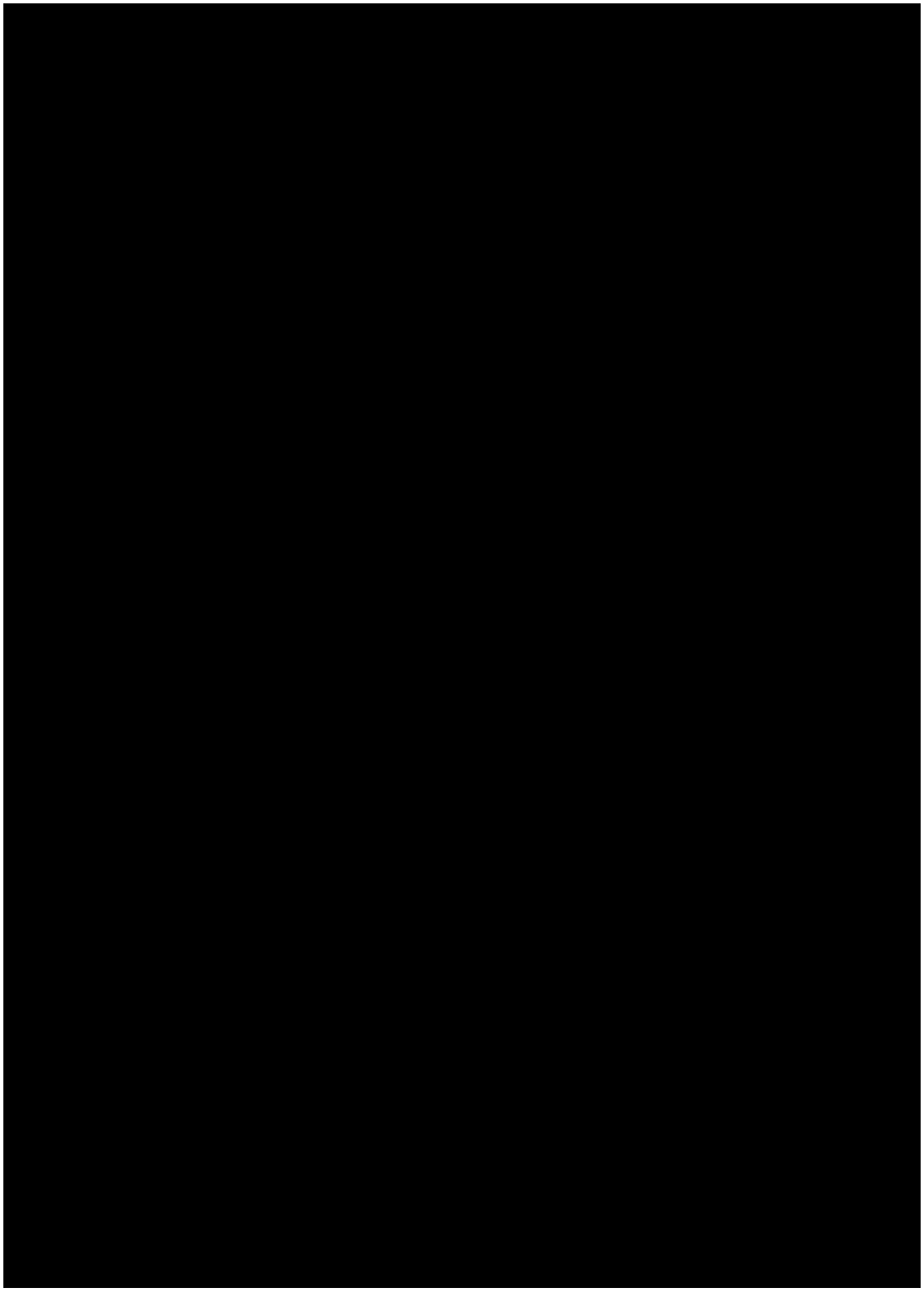
Additional Staff in New Mexico - Resources Inventory and Assessments Team

GIS Team- Jessie Rossbach, GIS Specialist
Linda Segura, GIS Technician
Heather Gordon - Cartographic Technician
Greg Smestad- Cartographic Technician

Richard Armijo, Resource Inventory Tech.- Remote Sensing/Snow Survey

Steve Lacy- Geornorphologist

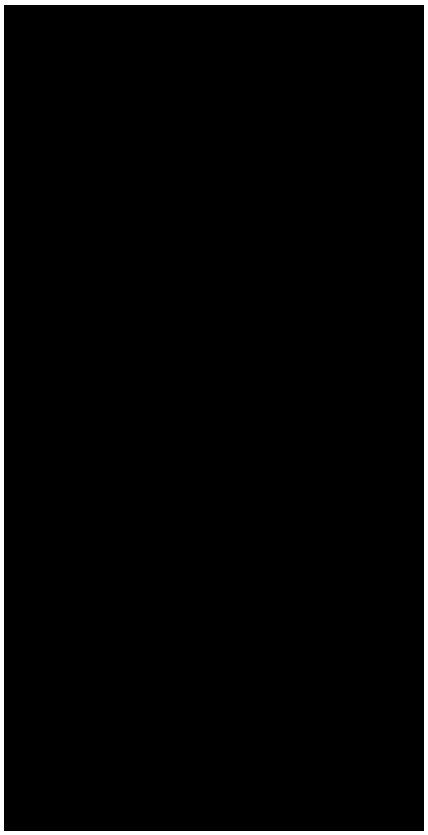
Stevanie Running Hawk- Administrative Assistant



National Cooperative Soil Survey

Western Regional Conference

June 14-19, 1998



Tuesday June 16, 1998

A New Perspective for the National Soil Survey Center[1]

The National Soil Survey Center (NSSC) in Lincoln, Nebraska is a dynamic vital link in carrying out the Natural Resource Conservation Service (NRCS) Federal responsibility of the National Cooperative Soil Survey (NCSS). During the past 10 years or so through the process of reorganization and redirection of responsibilities, the 79 staff members at the NSSC have emerged as the one largest single consolidated unit of soil scientists, research soil scientists, interdisciplinary staff, soil laboratory unit and support personnel of the Natural Resource Conservation Service.

The NSSC can be viewed as an extension of the Soil Survey Division (SSD), which provides a critical technical role in conducting the soil survey program for the Agency and the National Cooperative Soil Survey.

The NSSC has been in existence for about 10 years. During this period of time the management styles at the Center have changed several times to meet the perceived needs of its customers, the Agency strategic plan and the needs of the NCSS.

The management of the NSSC for the past few years has been that of a Steering Team concept supervised by the Director of the Soil Survey Division, Dr. Dick Arnold. The Steering Team of three to four members supervised about an equal number of staff consisting of a cross section of all disciplines and work areas.

Our new Chief for the Agency, Pearlie Reed, has elevated the role and significance of soil survey in the agency to the level of a Deputy Chief for Soil Survey and Resource Assessment. As Horace Smith, our new Director of the Soil Survey Division, noted during his presentation, Dr. Maurice Mausbach has been selected for this new Deputy area. In keeping with the demand for new products, GPRA, fund accountability and timely coordinated delivery of customer driven products and services, the Steering Team concept has been superseded by National Leaders responsible for their assigned subject or work area.

The new organizational plan includes five National Leaders in the areas of 1) Soil Classification and Standards, 2) Soil Survey Interpretations, 3) Soil Survey Technical Services, 4) Soil Survey Investigations and 5) Soil Survey Laboratory. Each National Leader will supervise all staff members in that specific discipline area. The Director of the Soil Survey Division will supervise each National Leader.

A brief review of the major functional areas for the National Leaders is as follows:

[1] Edited by James R. Culver, Acting Director, National Soil Survey Center, USDA-Natural Resources Conservation Service, Lincoln, Nebraska. Prepared from National Soil Survey files.

SOIL SURVEY LABORATORY

Provides national leadership for the Soil Survey Division's responsibilities in the following areas: soil characterization analyses in support of Agency missions using documented methods; research on methods development in support of NCSS; maintenance of in-house research facilities for in-house and field-based scientists; maintenance of the National Soil Survey Database and distribution of laboratory data and field pedon data; maintenance of the soil sample archive; standards laboratory for other cooperating laboratories; consultation for customers on an as-needed basis; and mutual interchange of scientific and soil survey information with professional colleagues in the USA and abroad. Works closely with soil survey investigations and members of the National Cooperative Soil Survey.

SOIL SURVEY INVESTIGATIONS

Provides leadership, coordination, and support for field investigations involving soil-geomorphic processes, soil genesis and Taxonomy, geospatial methods, soil moisture and temperature, use dependency, soil quality, heavy metals, carbon sequestration, biological processes, and many others. Works closely with the Soil Survey Laboratory, field soil scientists, university partners, and members of the National Cooperative Soil Survey.

SOIL SURVEY INTERPRETATIONS

Leads and coordinates the Soil Survey Division's efforts in developing philosophies, techniques, and applications for interpreting soil survey information. This includes updating and automating current interpretive procedures for use in NASIS; developing new applications to meet the demands of the Agency in implementing its programs and of other customers; and identifying training needed by soil scientists in understanding the applications and the use of soil information to solve their particular resource concerns. Examples of interpretations and technologies include the fuzzy set theory, cluster analysis, neural network analysis, risk assessment, SRPG, Soil Potential Ratings and their derivations using NASIS, and the traditional sets of national soil survey interpretations and their local adaptations.

SOIL SURVEY TECHNICAL SERVICES

Coordinates all National Soil Survey Center projects involving the application of soil survey information to specific needs and the integration of soil survey information with other resources and technology. This includes the derivation and application of soils information, including use of NASIS, to meet USDA and NRCS policy and program needs. Examples of projects include the adaptation of data for use in CRP, the development of Soil Explorer technology for displaying soil information on new media, overseeing information technology development projects such as developing data sets for FOTG, STATSGO and SSURGO. Provides National leadership in all phases of soils training for soil scientists and other interdisciplinary staff at state and field levels.

SOIL CLASSIFICATION AND STANDARDS

The Soil Taxonomy and Standards Staff provides technical leadership for the maintenance, improvement and coordination of the standards for the National Cooperative Soil Survey. These standards include Soil *Taxonomy,* the Soil Survey *Manual* and the *National Soil* Survey *Handbook.* They are recognized worldwide and are the backbone of the soil survey program in the U.S. The staff also provides training and technical assistance to MLRA Offices, State Offices, Federal and other agencies, universities and soil scientists from foreign countries for the purpose of making and interpreting soil surveys.

The new perspective at the NSSC will give high priority to 1) management, 2) customer driven products and services and 3) technical excellence.

MANAGEMENT

Management considerations in moving forward with the new perceptive at the NSSC will include the following:

- Accountability--The development and institutionalization of a system of accountability which will insure each employee knows what is expected of him/her and that the products and services developed at the Center are in direct support of field office technical needs or consistent with our obligations as part of the NCSS. Linking all NSSC activities to Agency strategic objectives and goals.

- Stability--The installation of a stable operational structure that complements the activities of the Center and allows each employee to know where they fit in and how they contribute to the overall mission of the Agency and goals of the Center.

- Capacity Management--Emphasis on coordination and working with partners, such as universities, global climate projects, Federal agencies and private industry. Learning to say 'no' when it is appropriate. Ensure we are a 'player' when individuals or groups are leveraging the Center's resources in support of their own projects.

- Capacity Building--Listening to our customers' needs and building capacity at the Center or building 'virtual' capacity with partners to meet those needs. Use the resources available and those acquired through capacity management to address emerging and critical Agency soil technology needs.

- Marketing--Be proactive in informing management and others of quality products and services by NSSC. Building a product and service line that will highlight our commitment to the NCSS and the Agency. Working directly with state conservationists and NCSS partners in building coalitions with partners so that when a soil technology issue confronts them they think of us.

Functional Assignments

The new management at the Center will give priority to the science of soil survey, maintaining many of our past commitments, increasing our capacity with new partners, and providing quality products and services in support of all Agency field staff as appropriate.

Functional assignments will include:

1. Provides national technical leadership for developing and implementing policy in the areas of collecting, interpreting and using soil information.

2. Develops national technical guidelines for the soil survey program.

3. Develops and assesses resource assessment criteria such as soil health indicators, prediction models, and tools involving resource conditions and tolerances.

4. Develops, tests, and improves soil databases; evaluates soils; and makes soil survey information available.

5. Provides technical support and assistance in the collection, interpretation and distribution Of soil information for new agency initiatives in areas such as Urban Conservation, Landscape analysis and site specific farming.

6. Provides technical leadership for identifying and conducting soil survey related research and technology development.

7. Manages and maintains the soil survey analytical laboratory to provide national and international soil analysis in support of field operations and agency programs, to set national and international standards, and assists other national and international laboratories to ensure data quality.

8. Provides leadership in development and direction in training employees in all aspects of soil survey activities. Trains other NRCS staff and other agencies and international users to use soil survey data and information.

9. Provides support for training in GIS use in soil survey in coordination with the soil survey staff at NCGS.

10. Provides technical support in developing and helping users of the three digitized data sets for the country: NATSGO, STATSGO, and SSURGO.

11. Participates in developing agency capabilities in managing and interpreting geo-spatial data.

Staff at the NSSC are involved in a large number of priority projects which are in keeping with the Agency and Soil Survey Division strategic issues. A summary of current NSSC priority activities is as follows:

SOIL SURVEY SUPPORT

The NSSC is the Agency source for soil survey support and knowledge. Soil survey publication accomplishments include 69 surveys to the printer for last fiscal year and 60 for this year. Estimations show the number of once-over surveys at about 400. The Center has been experimenting with "print-on-demand" and electronic versions of surveys for customers. The production phase of the digital soil data viewer (Soils Explorer) is scheduled for August 1998. This product will allow users to view soil interpretations, Digital Orthophoto Quad (DOQ) imagery, and reference data from the SSURGO database. The Center is supporting the data and interpretation development for this product. The NRCS Soils Hotline support is located at the Center. This hotline provides support to all NRCS State, MLRA, project and field offices with the implementation and maintenance of NASIS. This support includes integration of local hardware and software with NASIS installation and configuration, technical analyses support for the Soil Survey Scheduler. The Soil Survey Laboratory provides assistance to ongoing field activities. Thus far this fiscal year,68 projects include more than 2000 soil horizons for lab characterization. The Center has distributed 77 projects to our customers so far in FY98. The Lab continues to develop new analytical methods and to modify existing methods to ensure that they are environmentally friendly. The Lab also provides logistical support for all field activities, including both routine characterization and research.

STANDARDS & GUIDELINES

The Center maintains the standards of the National Cooperative Soil Survey (NCSS). These are *Soil Taxonomy,* the *Soil Survey Manual, Soil Survey Laboratory Methods Manual,* and the *National Soil Survey Handbook.* An 8th edition of the "Keys to Soil Taxonomy" will be published this summer. A second edition of Soil *Taxonomy is* nearly complete. The other standards have been recently updated and are available to our customers. Most of the standards have Internet access. A "Field Guide for Describing Soils" is ready for publication and currently can be accessed through our homepage. The NSSC provides leadership to the Federal Geographic Data Committee (FGDC) charged with developing standards for the distribution of soil data by federal agencies. The Laboratory is a depository for soil materials used in interlaboratory quality assurance standards and for research and development.

DATABASES

The NSSC provides NASIS technical analysis, implementation coordination, and soil science technical support to NRCS State, MLRA, and local field offices as well as technical consultation to the institutes and centers. Currently, NASIS 4.0 is being Beta tested and will be released for NRCS implementation in the field in June 1998. NASIS 5.0 analysis is underway with the MLRA and soil survey offices and will address field data collection needs. FGDC standards for soil survey data are maintained by the NSSC as a function of NASIS data dictionary maintenance and support activities. These activities include the development of protocols that assist the field soil scientists with the derivation or estimation of soil properties that are not readily observable or measurable in the field.

TRAINING

The NSSC coordinates six formal training courses with the National Employee Development Center. They are Basic Soil Survey - Field and Lab, Soil Correlation, Soil Technology -Measurement and Data Evaluation, Soil Technology - Programs and Application, Soil Science Institute, and Advanced Hydric Soils for Soil Scientists. In FY97, 219 participants were enrolled. The Center has several informal training coursestworkshops, which include four NASIS training courses. A total of 370 participants received training in one or more of the NASIS sessions in FY97. In addition, 7 MLRA Offices and 2 foreign countries received training in Soil Taxonomy. The NSSC provides assistance to the National Cartographic and Geospatial Center and to the Soil Quality Institute in designing and developing additional training courses in FY98. It is estimated that approximately 600 Agency employees will receive training from the NSSC in FY98. In addition to NFICS employees, the Center trains personnel from State Departments of Natural Resources, Conservation Districts, BIA, FS, NPS, BLM and Universities.

MARKETING/OUTREACH

The NSSC marketing plan focuses on products and services for the field. The Center works with partners and customers to increase minority and underserved farmers' participation in the soil survey program. These efforts include a project with underserved farmers in Arkansas and a proposed program submitted in cooperation with other Divisions/Centers in the Deputy area to work with 1890 universities to increase their participation in soil survey activities. The year 1999 marks the centennial year for soil survey. The Center schedules many activities in support of marketing soil survey and soil survey products. The Center's efforts will also include national meeting participation and a national celebration. Additionally, the NSSC supports and maintains the SSD and NSSC homepages and associated sections and documents. The Soil Survey Division homepage contains an explanation of Soil Survey Programs, Business Plan, Soil Survey Centennial Celebration and links to the World Soil Resources and National Soil Survey Center. The NSSC homepage on-line contains public electronic access to the Center's Business Plan, Standards for Soil Survey technical support documents *(National Soil Survey Handbook, Soil Survey*

Manual, Field Book for Describing and Sampling Soils, and *Keys to Taxonomy),* Soils Data access to Map Unit Interpretations Record data, SSURGO and STATSGO, National Soil Survey Lab data, NASIS, Hydric Soils, Published Soil Surveys, Research, and Training. (See NRCS Strategic Plan, Goal 1, Objective 1.2.)

RESEARCH & DEVELOPMENT

Domestic Activities - About 100 active research projects are underway, many of them cooperative studies with universities and other state and federal agencies. These projects are divided into nine areas: soil-geomorphic processes; soil genesis and taxonomy; field, laboratory, and geospatial methods; soil water and temperature; use dependency, soil quality, and heavy metals; carbon sequestration and biological processes; soil interpretations; facilitating activities; and cooperative projects with universities and other groups. NSSC research findings are used in a variety of applications. Many of the research products are used directly in support of the Agency's soil survey activities. These products include development of new techniques, such as new mapping techniques and use of soil surveys in site-specific management, detailed soil characterization and behavior information, and models of relationships among soils, various individual soil parameters, climate, and vegetation. Customers outside of the Agency use our information for a wide variety of purposes including global-scale climate computer models, wildlife behavior, and engineering activities. Geospatial (GPR, EM) research and assistance has been effective in supporting field soil survey, waste management and archeological evaluations.

International Activities - The Center maintains a leadership role in international soil science activities. The Soil Survey Laboratory provides leadership in methods development and standardization and is recognized as one of the premier soils laboratories in the world. The Center receives many visitors from around the world and requests for assistance weekly. Several international cooperative research projects are being conducted. An example is the Permafrost Soil Map done in conjunction with scientists in Canada, Russia, China, Germany, Denmark, and others in cooperation with the International Permafrost Association. This activity promotes common soil mapping procedures. Another project with Canada and Mexico produces a carbon map of North America. International activities provide information useful to the NRCS for the improvement of the Soil Taxonomy and at the same time promote the use of the Soil Taxonomy by other countries. The Center has developed and maintains the largest database of soils from around the world. Scientists from the NSSC actively participate as invited participants in international meetings every year. The Soil Survey Laboratory has archived 93,000 soil samples from the U.S. and 80 foreign countries.

COOPERATIVE PROJECTS

The Center has technical interactions with all of the Agricultural Experiment Station representatives to the NCSS. Staff are members of the Federal Geographic Data Committee and through it have interaction with 10 Federal agencies. The Center participates in the developmental effort by seven agencies to produce a handbook on stream corridor restoration. Analytical data and technical interaction are provided to ARS for the development of process models for wind and for water erosion (WEPS, WEPP), for the main general plant growth model (EPIC), and for erosion of rangelands. Staff are involved in development of RUSLE and the multi-agency effort to establish a common use interface for erosion models. GIS activities include cooperative work with EROS, Goddard Space Center, Standing Rock Sioux Tribe, FS, NIPS, Canada, Mexico, and a multi-agency effort to develop the ecological units for the U.S. Laboratory analyses are done and technical advice is given on soil quality and with the SQI, the Northern Plains Soil Quality Team, ARS, and EPA. Field moisture and temperature for drought monitoring water supply and flood prediction measurements are conducted with the National Water and Climate Center and also involves the International Permafrost Association, the High Plains Regional

Climate Center, NIPS, National Biological Survey, the Smithsonian Institute, and 10-15 university people.

SOIL INTERPRETATIONS/AGENCY PROGRAM SUPPORT

The Center maintains a national perspective in support of soil interpretations for Agency programs. An interpretations module recently developed by the Center enables field and state offices to meet local soil interpretation needs. Interpretations developed by the Center provide standard interpretations for soils publications and national program initiatives. The Center interacts with scientists of other agencies to test erosion equations and other models. STATSGO, a national soils geospatial database that is maintained by the Center, provides a basis for interrelating many agro-ecological processes to other data layers. The diverse and interdisciplinary nature of the staff contributes technical support to many NRCS programs and activities. Programs in range, forestry, agronomy, soil quality, and stream corridors benefit from Center staff input to practice standards, manuals, training, and ecological linkages. Products arising from Center activities include soil quality information sheets, conservation buffer strip and agriculture waste interpretations, soil based productivity ratings for CPR, soil conditioning index for conservation planning, site specific management, urban soil interpretations, global carbon studies, and hydric soils. Center staff also actively participate in Agency emphasis activities including the National Conservation Buffer Initiative and the Core 4 Conservation Technology Effort.

Linkages to Agency Strategic Objectives

The main activities of the National Soil Survey Center are summarized above. Center activities fit within Goal 1 of the NRCS strategic plan, "Individuals and their neighbors working together as effective and willing stewards of the natural resources on their property and in their communities." Within Goal 1 the Center's efforts support objective 1.3, "Private landowners and communities with the science-based information and technologies they need to conserve natural resources. "

The Center's strategies for achieving this goal are aligned closely with the Agency's. The Center supports soil survey activities by providing the standards, laboratory analyses, data base support, training, and research needed to conduct a national soil survey program. Soil survey is a fundamental tool required for conservation planning efforts. The Center is also in the process of making soil survey data more available to the public through the Internet.

The Center is working to strengthen and expand natural resource assessment through the many research and data acquisition projects associated with global climate change.

I personally see the NSSC staff in the future to be more focused on customer-driven assistance and products. We at the Center will be responsive to your needs and those of other cooperators and state and local partners. Collectively we all need to be responsive and work collectively together in a productive atmosphere. I feel our combined soil survey work will enhance the marketing and visibility of the National Cooperative Soil Survey. Conferences such as the excellent one here in the Westem Region provide a common focus to move the soil survey program into the next century with high quality visibility.

SOIL QUALITY

Arlene L Tugel
Acting Director
USM - NBCS Soil Quality Institute
June, 1998, Albuquerque, NM

http://www.statlab.iastate.edu/survey/SQI/sqihome.shtml
atugel@nmsu.edu

SOIL AND WATER QUALITY:
An Agenda for Agriculture (NRC, 1993)

"Protecting soil quality, like protecting air and water quality, should be a fundamental goal of national policy."

EIGHT INSTITUTES

- Grazing Lands Technology – [Fort Worth, TX]
- Information Technology - [Fort Worth, TX]
- Natural Resources Inventory and Analysis [Ames, IA]
- Social Sciences – [Greensboro, NC]
- Soil Quality – [Ames, IA]
- Watershed Sciences – [Seattle, WA]
- Wetland Sciences – [Laurel, MD]
- Wildlife Habitat – [Jackson, MS]

OUR CHARGES

- New technology
- Assessment Tools for field staff

--Present state of soil health
--Impact of cropping systems on the soil

- Systems to improve soil quality
- Marketing
- Training/Informational materials for field staff and clientele

ACCOMPLISHMENTS

- Soil Health Card Design Manual [7 states]
- Soil Quality Kit Manual/Interpretatons
- Reference Soils
- Soil Biology Primer
- Agronomy Soil Quality Technical Notes
- Soil Quality Information Sheets (w/NSSC)

[Available through Products Catalogue]

Soil Quality Card Vision

- Wisconsin Soil Health Scorecard
  - Simple to use
  - Locally adapted
  - Buy-in by farmers, NRCS, SWCD's, Ext.
  - Build partnerships
  - Introduce soil quality

Soil Quality Card partners

- OR, MD, MT, NM, ND state/IRT/field offices
- NRCS State Liaison Team—1per region
- CTIC
- Cooperative Extension
- Conservation Districts
- 50+ farmers

Soil Quality Cards

- For farmers, by farmers
- Local
- Qualitative
- Farmers descriptive terms

Farmer terms

- Tilth and structure

  - cloddy
  - powdery
  - massive
  - flaky
  - crumb
  - porous
  - granular

Farmer terms

- Terms are related:
  - Drainage-infiltration-water holding capacity

Farmer meetings

"The soils is our factory. If we don't take care of it, we are out of business."

George Bodfrey

MD farmer

Who will use the Card?

- Farmers—Gardeners
  - Do-it-yourself-tool

- NRCS-Districts-Extension
  - Marketing soil quality

  - "Not" for the farm plan folder

Soil Quality Kit

- Soil respiration
- Bulk density
- pH
- Aggregate stability
- Earthwork test
- Infiltration
- EC
- Siol nitrate
- Slake test

USDA-ARS/NRCS-SQI

Soil Quality Kit – Instructions

- Instruction Manual
- Interpretive Guide

Available on SQI homepage
NRCS-SQI/ARS

Soil Biology Primer

- Loose leaf notebook of 8 Chapters on
  --Soil Food Web
  --Soil Organisms
  --Management Considerations
- East to read with may illustrations

SQI, Oregon and Ohio State Universities

Farming System Project

- Vision: To develop credible procedures that can be used by field office personnel and agricultural professionals to quickly and accurately
  --assess,
  --compare, and
  --identify farming systems that enhance soil quality

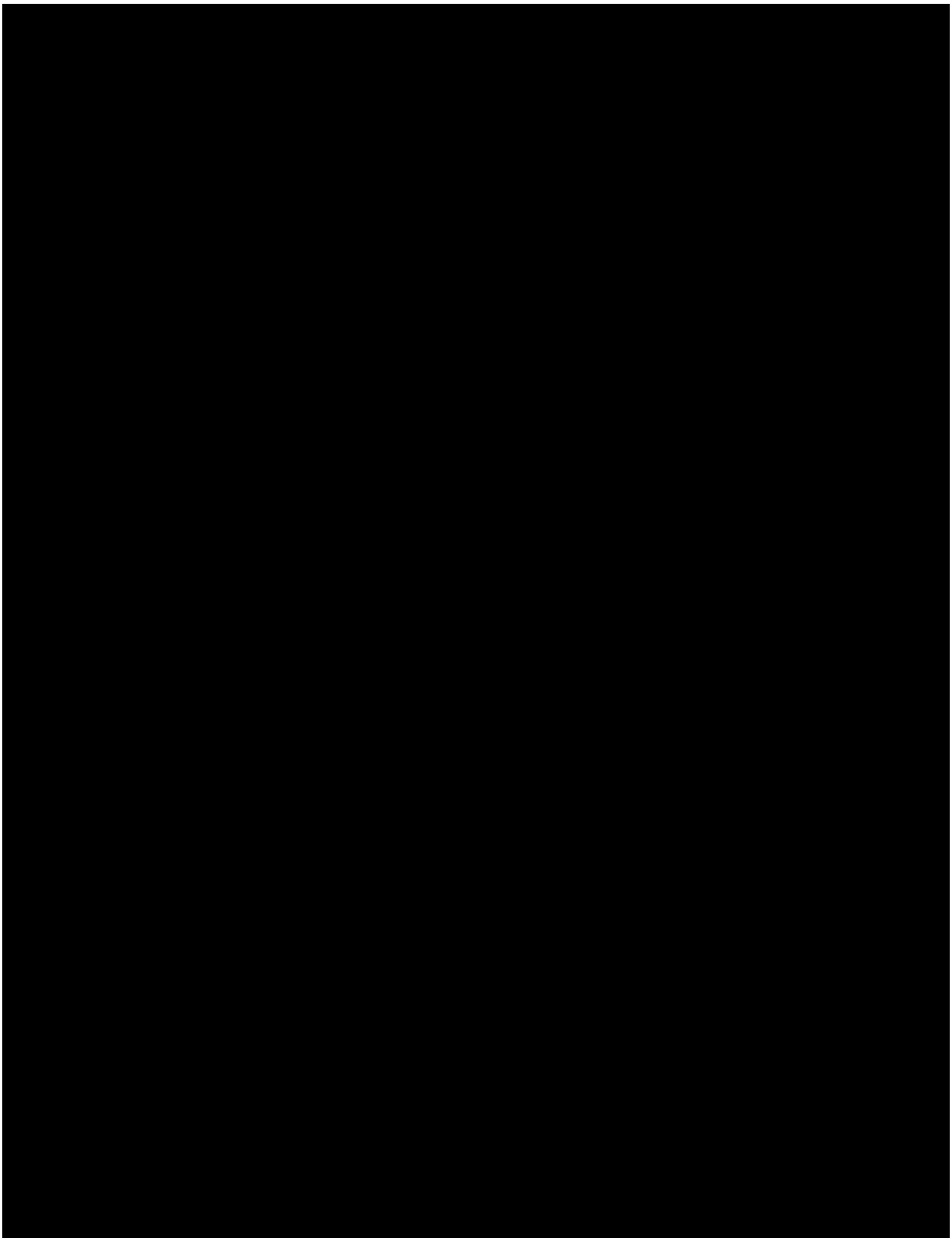
Farming System Project

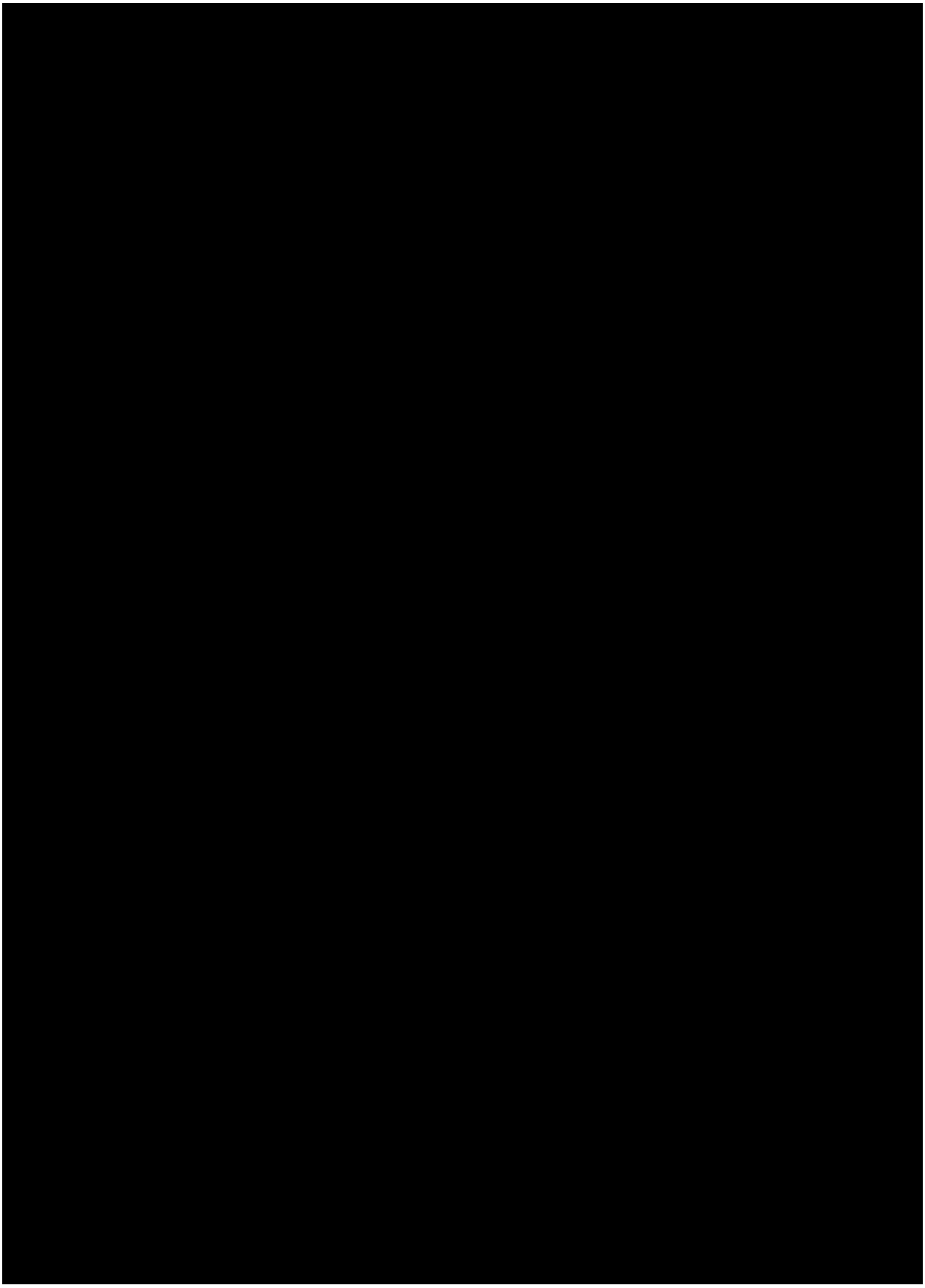
Farming System—

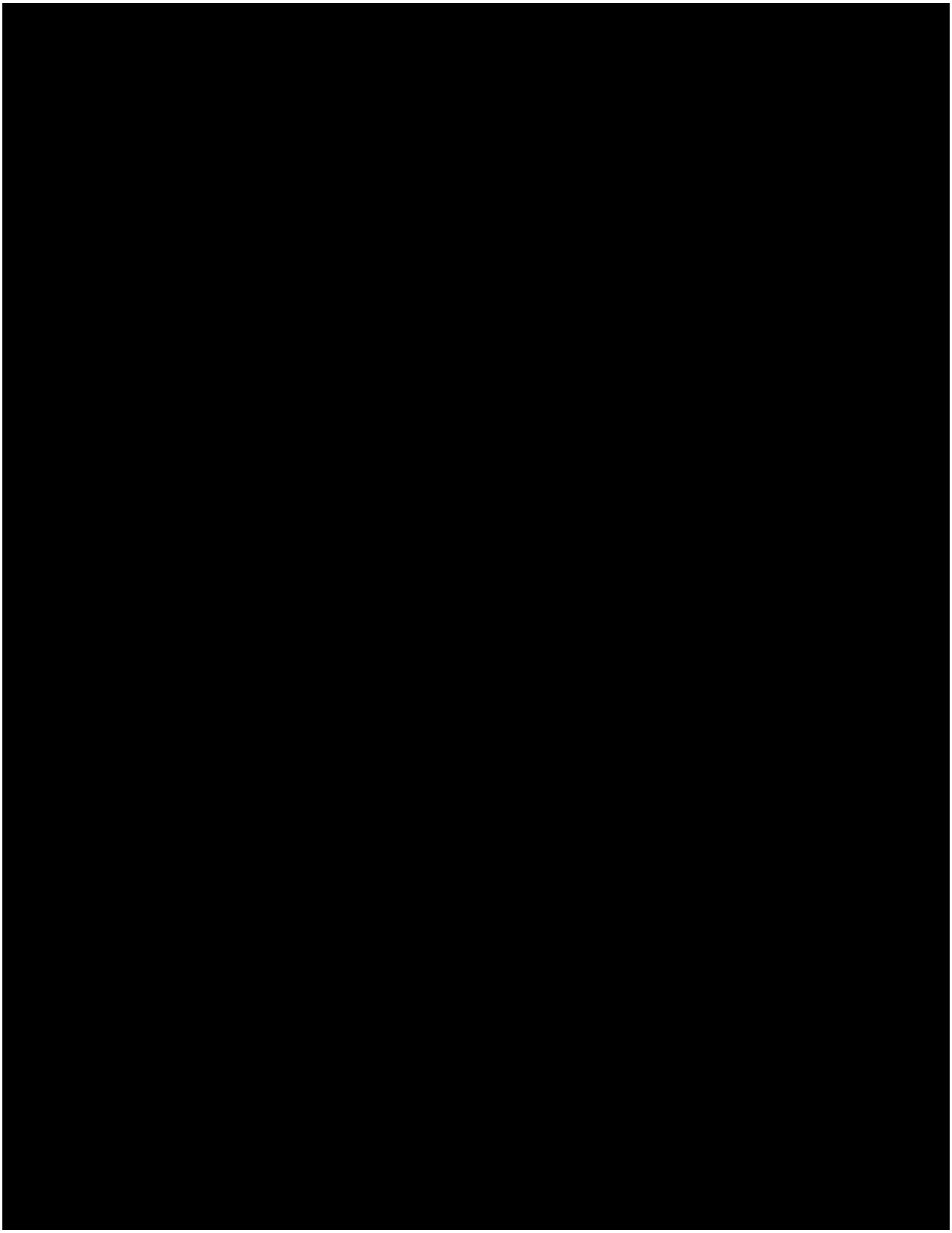
A method of management which affects agronomic, economic and ecological functions of a given land area.

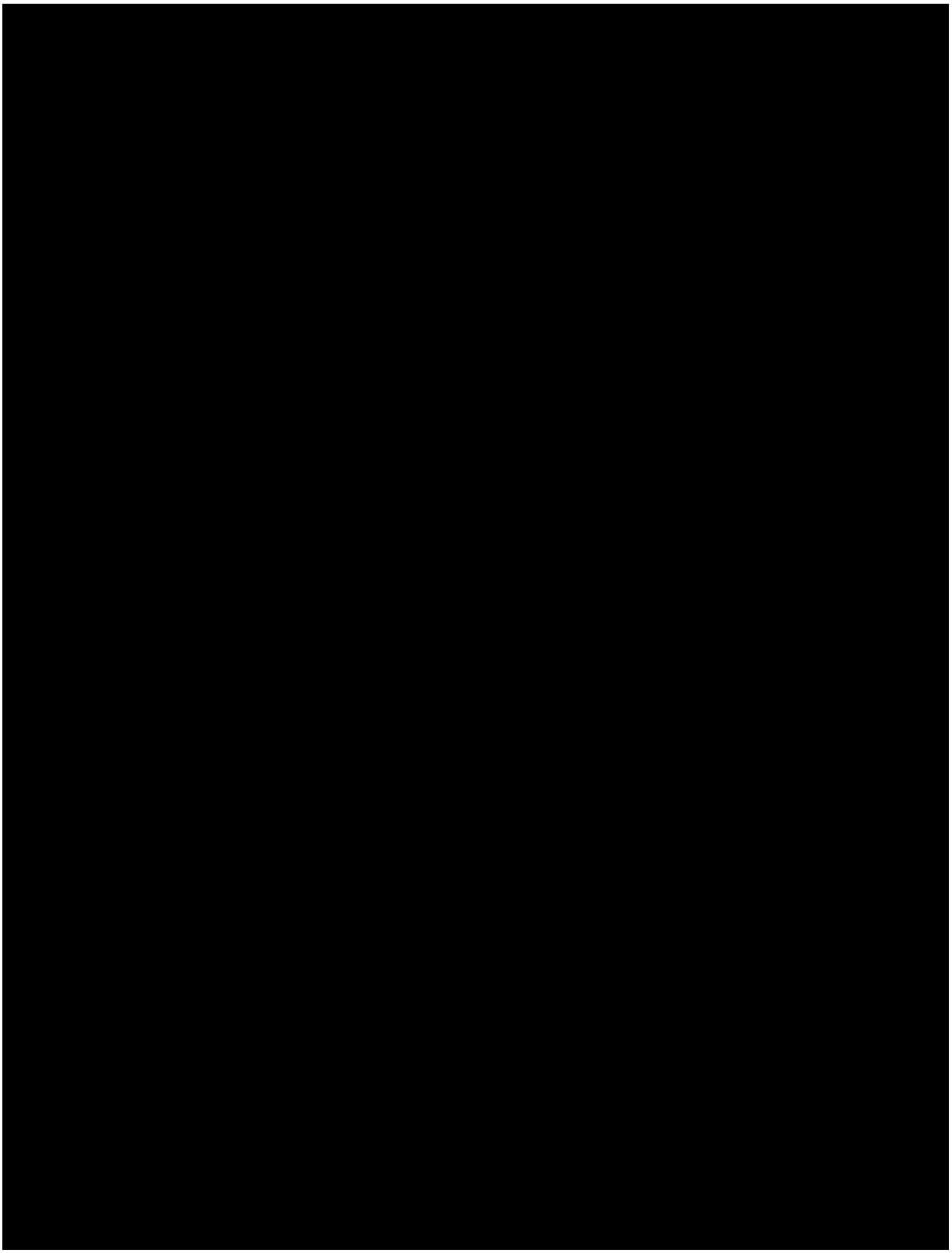
FS Advisory Group—SQI, CTIC, NRCS, ARS

Soil Quality—the capacity to function









Eco-Geomorphic Systems and Natural Cycles of Desertification in the Chihuahuan Desert

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INTRODUCTION

The Chihuahuan Desert is North America's largest desert, extending from New Mexico southward into central Mexico (Fig. 1). It is characterized by contiguous stands of creosotebush, tarbush, and mesquite with intervening mosaics of grasslands. The exact boundary of the Chihuahuan Desert varies somewhat depending of whether the boundary was based on vegetation or climatic data. The boundary used by most ecologists is probably that by Schmidt (1979), which is based on climatic data.

The term *"eco-geomorphicff is* used because it emphasizes the important relationship between plant cover and erosion. Erosion, in turn, is linked to sediment deposition, which together are primary factors in the formation of Quaternary landforms in the Chihuahuani Desert. As used in this paper, *desertification* refers to a vegetation decline sufficient to cause a period of erosion and sedimentation significant enough to create mappable geomorphic surfaces.

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The Chihuahuan Desert is a good place to study natural cycles of desertification for three reasons. First, its Basin and Range geology contains topographic relief and closed basins conducive to a stratigraphic record of buried soils. Second, its ecological shifts alternate between shrublands and grasslands, with shrublands having much exposed bare ground that promotes erosion, and grasslands having little bare ground that curtails erosion and promotes soil formation. Third, the grasslands are primarily C4 plants and shrubs are primarily C3 plants, each of which leave distinct isotopic signatures.

According to this hypothesis, greater effective precipitation occurred during glacial advances (collectively termed glacio-pluvial periods).

Some of the most conclusive evidence for increased effective moisture during glacial advances comes from Pleistocene lakes in the Southwest. Although many are now dry, they contained much water during past glacial periods based on maps of their former shorelines (Smith and Street-Perrott, 1983; Waters, 1989). As a result of the increased moisture during glacio-pluvial periods, greater volumes of water were carried by the Rio Grande at the same time that denser vegetative cover curtailed erosion on the surrounding landscape. The river, therefore, had greater discharge and carded less sediment, causing it to downcut and leave relict surfaces. Upon the return of an alternating and interglacial cycle, the river carried less water and more sediment, causing it to partially backfill and raise the base level. During the next glacial advance, the river again downcut leaving another generation of surfaces, then partially backfilled again during the subsequent and interglacial. After several cycles of glacial-interglacial periods, a stepped sequence of surfaces was produced, with the oldest at the highest elevation and the youngest near the level of the modem floodplain.

The stepped surfaces made it possible to determine how time affected soil development. It was recognized that young soils contained less calcium carbonate than older soils (Gile et al., 1965; 1966). As such, the soils could be divided into four stages of calcium carbonate accumulation, where young soils contained calcium carbonate in the form of filaments and pebble coatings (Stage 1) in contrast to older soils (Stage 11 and 111) that, with time, transformed into carbonate-plugged horizons with laminar layers (Stage IV) (Gile et al., 1966). This observation that soil profiles progress through four carbonate morphological stages was important because it indicated that the multiple surfaces of the river system were coeval with the multiple surfaces of the alluvial fan system (Gile et al., 1981).

Alluvial Fan System

The alluvial fan system, like the river system, contains stepped surfaces. Since the river surfaces were theorized to be produced by glacial-interglacial climate changes, it was postulated that the analogous fan surfaces were also produced by glacial-interglacial climate changes (Hawley, 1975; Gile et al., 1981).

One model to explain how the fan system responds to environmental change is given in Figure 3. In this model, which is modified from Bull (1991), a decline in rainfall, an increase in temperature, or possibly an increase in atmospheric C02 (Polley et al., 1993) can cause a shift from grass to shrub vegetation. The result is a decline in vegetation density and increased bare ground. This causes increased erosion which, in turn, causes further decline in vegetation as topsoil is eroded. The result is sediment yield in the mappable form of fans, valley fill, and terraces.

Buried soils, or paleosols, are common in the alluvial fan system where aggregation occurs (Fig. 3). Buried soils are important for paleo-environmental studies because they contain information about climate and vegetation that occurred before the soils were buried. Two types of paleo-environmental information are contained in paleosols: fossil pollen (Freeman, 1972; Gish, 1993) and stable carbon isotopes in pedogenic carbonates (Cerling and Quade, 1993). Because pedogenic carbonates are abundant in the soils of the Chihuahuan Desert, unlike fossil pollen which readily degrades, stable carbon isotopes are very useful paleo-environmental indicators. This is because plants have distinct isotopic signatures determined by whether they use the C3 or C4 photosynthetic pathway (Ehleringer, 1989; Boutton, 1991). C3 plants include most plants, including most desert shrubs. C4 plants include most of the native grasses in the Chihuahuan Desert (Syvertsen et al., 1976). When pedogenic carbonates precipitate in soils, they acquire isotopic signatures proportional to the abundance of C3 or C4 plants. So by analyzing the

isotopic content of pedogenic carbonate, it is possible to determine if the carbonate formed under C3, C4, or a combination of the two vegetation types (Cerling, 1984; Ceding and Quade, 1993).

However, for this technique to work, the carbonate crystals must have precipitated from the soil solution *in situ*, rather than being the result of illuvial calcareous dust, which can be determined with electron and light microscopy. If the carbonate crystals have distinct, un-abraded crystal faces, then this is evidence for *in situ* precipitation. Carbonate crystals in the form of calcified microbes are also evidence of *in situ* precipitation (Monger et al., 1991).

As an example of how carbonate isotopes can be used as an indicator of desertification, Figure 4 illustrates an abrupt shift in δ13C values (Cole and Monger, 1994). This isotopic shift corresponds to deposition of younger (Organ) sediments. During the late Pleistocene when the Jornada II soil was at the land surface and carbonate crystals were forming, their isotopic signatures indicate that the land surface was covered with a large percentage of C4 vegetation. With the onset of deposition, however, there was a major shift toward C3 vegetation. We interpret this isotopic shift to be evidence that C3 shrubs, with much bare ground, replaced the grassy C4 vegetation, which had previously curtailed erosion and promoted soil formation.

The Eolian System

The eolian system is most prevalent in the broad, sandy intermontane basins. The rationale for using the eolian system as a paleoclimate indicator is based on the premise that wind erosion and sedimentation are most active during periods of aridity when vegetation is sparse. As vegetation declines in response to environmental changes, mappable dunes, sand sheets, and deflational surfaces are produced (Fig. 5). For instance, in the Hueco Basin near El Paso paleodeflational surfaces are common and important stratigraphic markers (Blair et al., 1990). Based on radiocarbon dates of charcoal and soil carbonates, a major paleodeflational event occurred about 8,000 years ago (Monger, 1993), which is the same time that a major period of erosion occurred on the alluvial fan system (Gile, 1975) and backfilling occurred in the Rio Grande river system (Hawley, 1975).

Because the Basin and Range province, which contains the Chihuahuan Desert, is characterized by extensional tectonics, normal faults in broad, intermontane basins have produced linear depressions that have accumulated eolian sediments. These depressions have provided some of the most complete eolian sedimentation records in the region. Buck (1996) investigated the isotopic signatures of buried eolian soils. She found a similar isotopic trend in the eolian system as was found in the alluvial fan system (Fig. 4). In both systems, maximum C4 plants occurred in the late Pleistocene, around approximately 17,000 years ago, based on C-14 dates of soil carbonate, whose absolute dates are approximations. Both systems also display a major shift toward C3 vegetation around approximately 7,000 $^{14}C_{(carb)}$ -years -ago. In the basin floor eolian system, however, the isotopes reveal a recovery of C4 grasses until about 2,000 $^{14}C_{(carb)}$-years-ago, when another, but smaller, shift toward aridity occurred. After that time, the carbonate isotope record ends.

As mentioned above, the isotopic shifts presented in Figure 4 are largely based on C-14 dates of pedogenic carbonates, which must be viewed as approximate ages since carbonate accumulates during a span of time and is prone to dissolve and re-precipitate in some instances. The carbonate C-14 dates are, nevertheless, consistent with buried charcoal dates in the region that indicate major erosion-sedimentation events occurred about 7,500 and 2,000 years ago (Gile, 1975). These dates are also times of landscape instability in other parts of the Southwestern Deserts (Antevs, 1955). Archaeological changes in the northern Chihuahuan Desert occurred at about these times. The 7,500-year shift roughly corresponds to the Paleoindian/Archaic boundary, when people converted from being big game hunters to being hunters

and gatherers, and the 2,000 year shift corresponds approximately to the Archaic/Formative boundary when some agricultural began (Camilli et al., 1988).

DURATION OF DESERTIFICATION EVENTS

How long do natural cycles of desertification last? Cyclic landscape evolution is suggested by the stepped geomorphic surfaces occurring astride the Rio Grande and on the alluvial fan systems, as well as by the stacked sequences of buried soils. The isotopic data presented above covers only the last sequence of surfaces, representing the latest shift from pluvial to arid conditions which occurred during the last glacial-interglacial (i.e., Pleistocene-Holocene) transition.

However, based on the observation that aridity and landscape instability characterize our present interglacial period and produced the most recent geomorphic surfaces, it is postulated that the older geomorphic surfaces were the result of previous interglacial periods (Hawley et al., 1976). Since each interglacial period occurred about 100,000 years apart (Morrison, 1991), it follows that each step in the stepped sequence of surfaces might also be about 100,000 years apart.

To test this hypothesis, accurate surface exposure and radiometric dating techniques that extend back beyond the limit of C-14 dating are needed. At this time, only the younger and older soils in the stepped surfaces in the Chihuahuan Desert have accurate chronologic control. The younger surfaces--those formed during the last deglaciation --have chronologic control based on C-14 dating of buried charcoal, organic and inorganic carbon, and archaeological remains (Gile et al., 1981). The older soils have chronologic control based on paleornagnetism, volcanic ash, and vertebrates fossils (Strain, 1966; Tedford, 1981; Mack et al., 1993). However, the intermediately-aged soils, lack accurate chronologic control. Thus, at this time the linkage between the interglacial periods and the stepped sequences remains a hypothesis (Fig. 3 and Hawley, 1975).

In addition to the stepped sequence of surfaces, however, the stacked sequence of buried soils also support the landscape evolution model that links desertification to and interglacial periods. Here, the modern interglacial soils are at the top of the sequence and can be compared with underlying paleosols. The modern interglacial soils have less pedogenic development, lacking well-developed calcic and argillic horizons in contrast to underlying paleosols. This pattern of stacked paleosols indicates a succession of aggradational cycles. In is thought that the cycle begins during periods of aridity when sediment eroded from upslope soils buries surface soils in aggradational positions. This is then followed by a return to landscape stability and the formation of soil horizons in the newly-deposited sediment (Hawley, 1975). Therefore, like the stepped surfaces, the stacked sequence of buried paleosols indicates cyclic landscape stability and instability. Moreover, based on the observation that the youngest alluvial package was deposited during our present and interglacial, it is presumed that older alluvial packages were deposited during previous interglacials, with soil horizons forming during intervening glacio-pluvial periods when landscapes stabilize due to increased plant cover (Gile and Hawley, 1966).

THE HUMAN IMPACT ON DESERTIFICATION

Much scientific effort has been devoted to determining the role humans have played in desertification (e.g., Skujins,1991; Mouat and Hutchinson, 1995). In the northern Chihuahuan Desert, two forms of evidence indicate that many grasslands have deteriorated and have been replaced by shrublands in the last 150 years. The first form of evidence is vegetation surveys. On the Jornada Experimental Range north of Las Cruces, vegetation records extend back to 1858. These records, combined with later surveys in 1915, 1928, and 1963, indicate that desert shrubs have increased and grasses have decreased during this time period (Buffington and Herbel, 1965).

The second form of evidence is contained in the soil stratigraphic record associated with coppice dunes. Gile (1966) studied land survey notes made in 1857, 1885, and 1922. He returned to specific locations where notes on topography and vegetation were made. In those locations, the land that had previously been described as smooth grasslands, were now mesquite shrubland with no grass. Upon excavating the dunes, he found the former smooth land surface buried by recent sands in the mesquite bushes. In a similar study, mesquite coppice dunes were excavated in 1994 on the Fort Bliss Military Reservation north of El Paso (Monger and Buck, 1995). "A" horizons were commonly preserved in the coppice dunes at approximately the same elevation (Fig. 5). Historical artifacts, such as nails, bottles, and horseshoes occurred atop the "A" horizons, indicating that the vegetation change occurred after the artifacts were deposited.

The cause of vegetation change during Historical time in the northern Chihuahuan Desert may be the result of several factors. Over grazing can be a factor in the conversion of grasslands to shrublands (Milchunas and Lauenroth, 1993). Drought is known to drastically reduce grass cover, regardless of grazing history (Herbel and Gibbens, 1996). Fire suppression is another factor (Betancourt, 1996). In recent years, increasing atmospheric $C0_2$ has been postulated to be an additional factor in shrub/grassland dynamics (Polley et al., 1993; 1996).

Although vast areas have changed from grassland to shrubland in the last 150 years, many areas have not experience vegetation change. This indicates that certain soil-geomorphic sites are more ecologically fragile than other sites. Some soil-geomorphic sites are resource sinks, where rainfall run-in, nutrients, and soil water holding capacities create hardy vegetation communities that withstand stresses (Herbel et al., 1994). In contrast, other soil-geomorphic types are fragile, supporting vegetation communities that easily succumb to environmental stresses. For example, on the Jomada Experimental Range north of Las Cruces, Herbel and Gibbson (1996) observed that grasslands are most stable and resilient in low-lying areas with fine textured soils, and on sites composed of shallow sand over petrocalcic horizons. In contrast, sites composed of only deep sand experienced drastic shrub invasion and erosion.

These examples and similar research by McAuliffe (1994) illustrate the importance of geornorphic-vegetation relationships in and regions. Future maps that delineate these relationships may help describe the susceptibility of land to desertification. This may prove very useful for land management by showing which land should be used and which land should be protected.

The relationship between soil-geomorphic mapping units and Historical vegetation change is one visible example of the sensitivity exhibited by ecosystems in the Chihuahuan Desert. Owing to its geologic setting and its C4/C3 vegetation, the Chihuahuan Desert also contains a stratigraphic and isotopic record of prehistoric ecologic changes. This is largely because the Chihuahuan Desert has three geomorphic systems that respond to climatic and vegetation changes--the river, fan, and eolian systems.

These systems suggest that major cycles of desertification correspond to arid-interglacial periods that are spaced approximately one hundred thousand years apart.

The human impact is superimposed on the current interglacial period of desertification. However, even on the vast time scale of glaciation, maps of Historical eolian and Historical alluvial deposits are needed to put into perspective the amount of human-induced erosion. Such maps will not only provide a measure of the human impact, but will also help identify ecologically fragile areas and identify desertification processes that can worsen in the future (Schlesinger et al., 1990). The knowledge gained by studying eco-geomorphic dynamics of the past may be applicable to other dryland regions that, like the Chihuahuan Desert, straddle unstable arid/semi-arid boundaries. By studying human impact on desertification, we will also understand and predict desertification's impact on humans.

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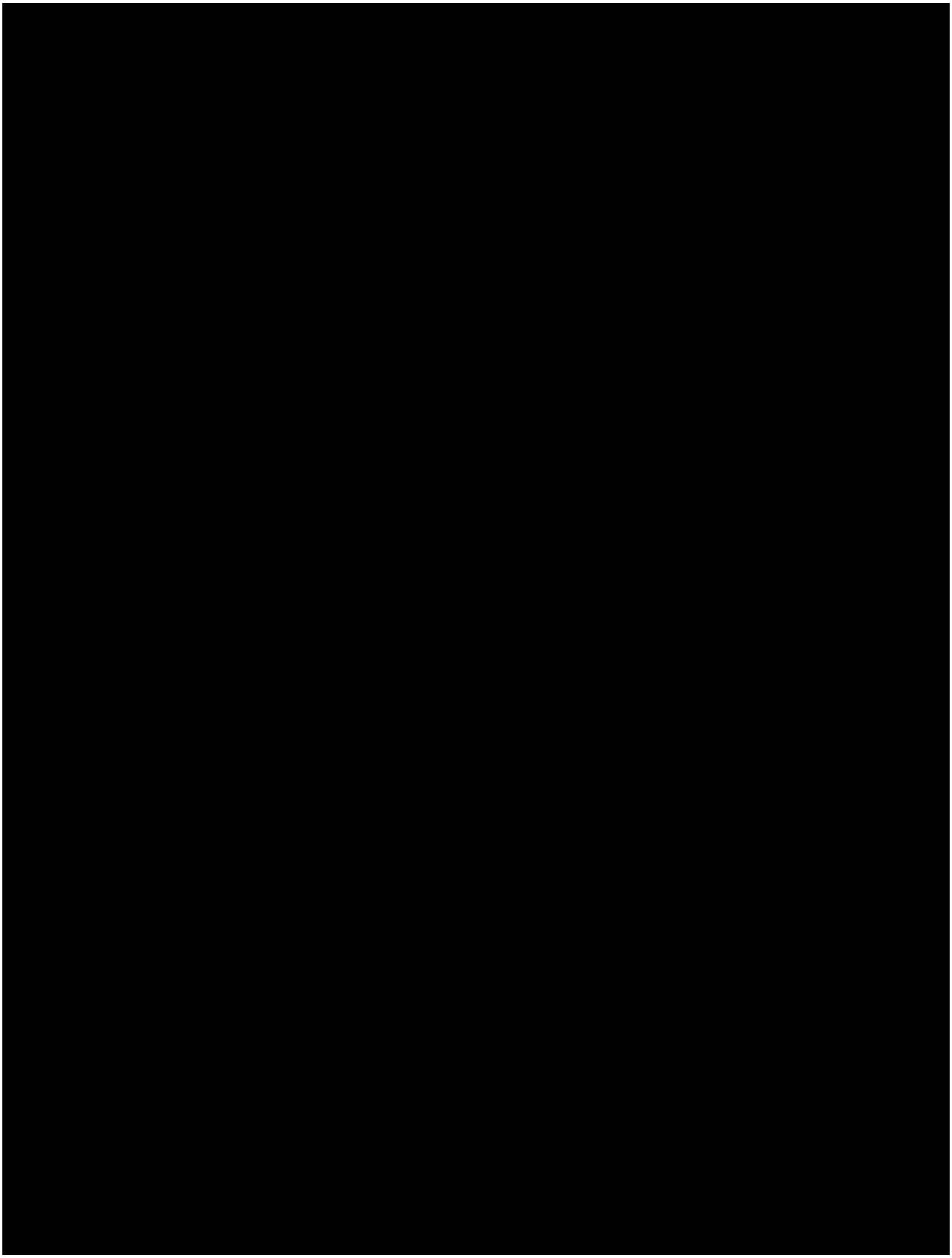
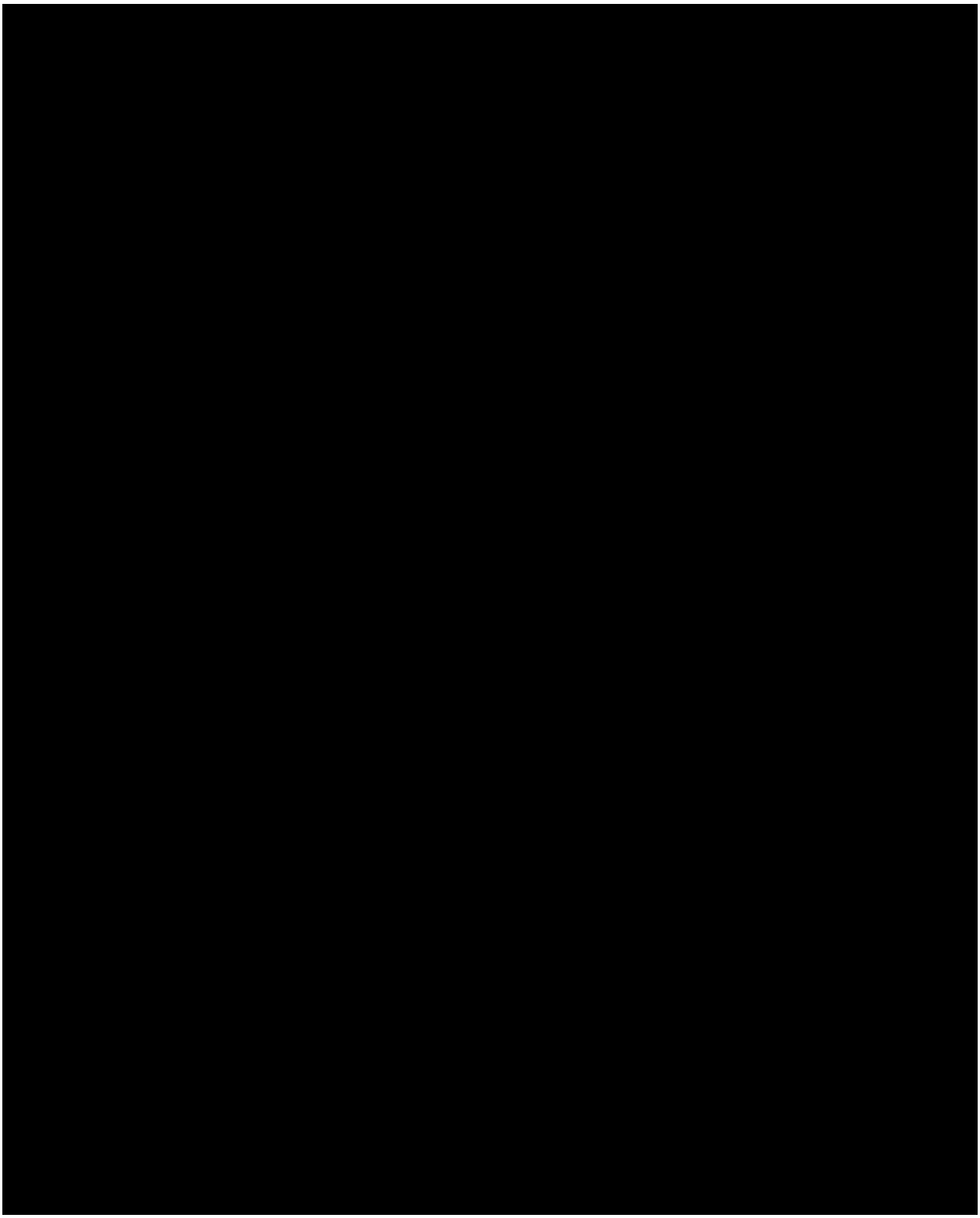
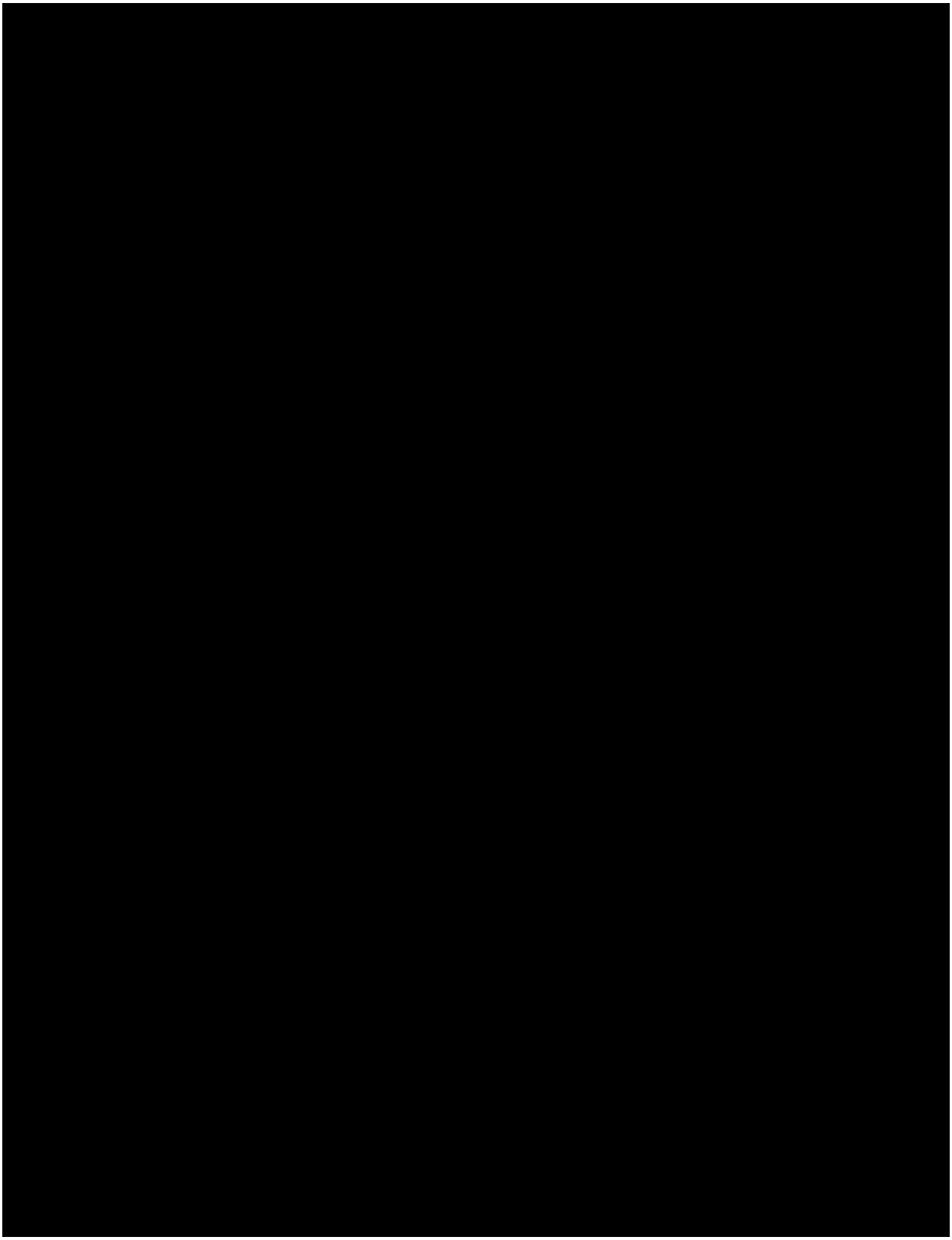
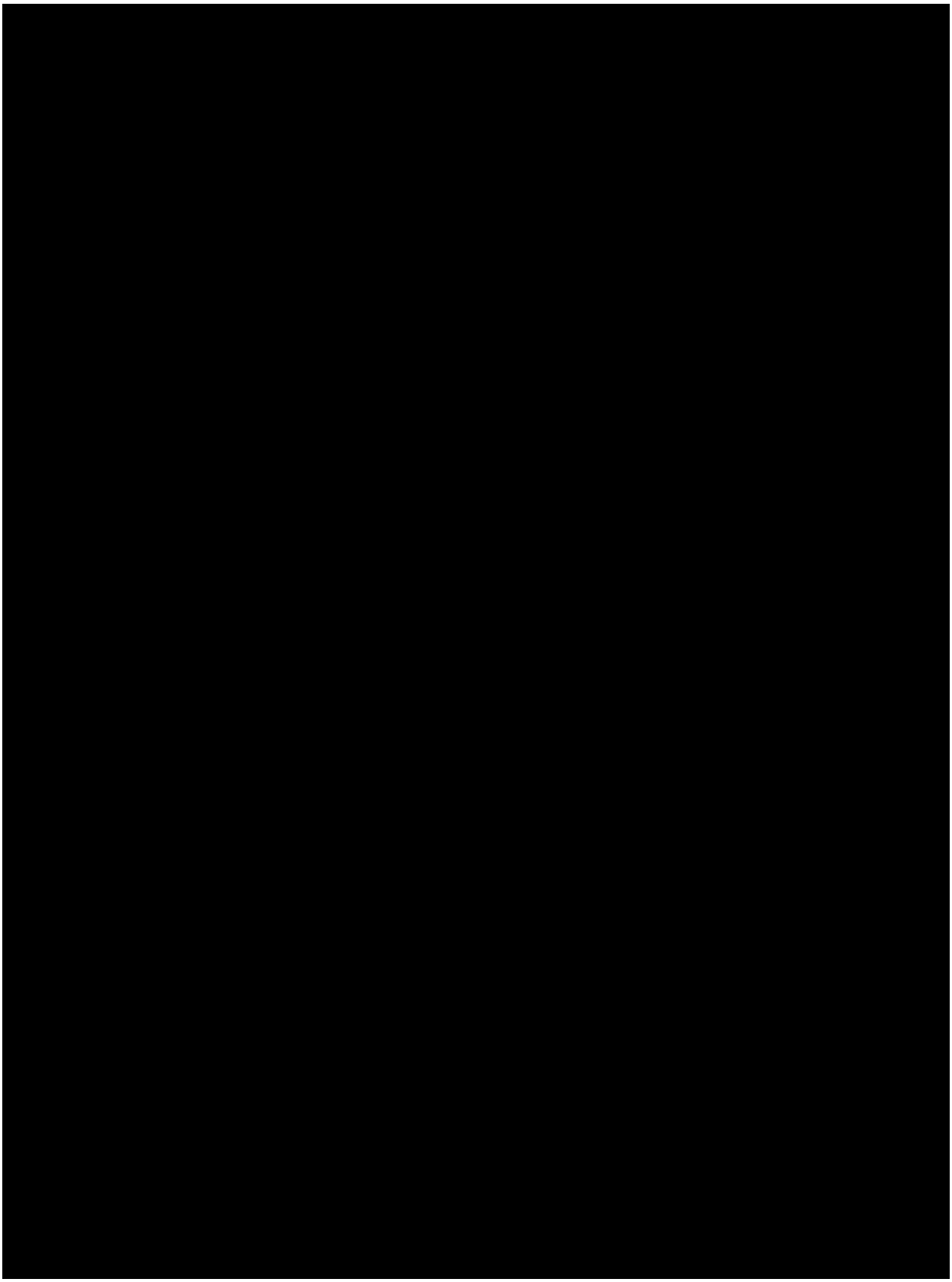
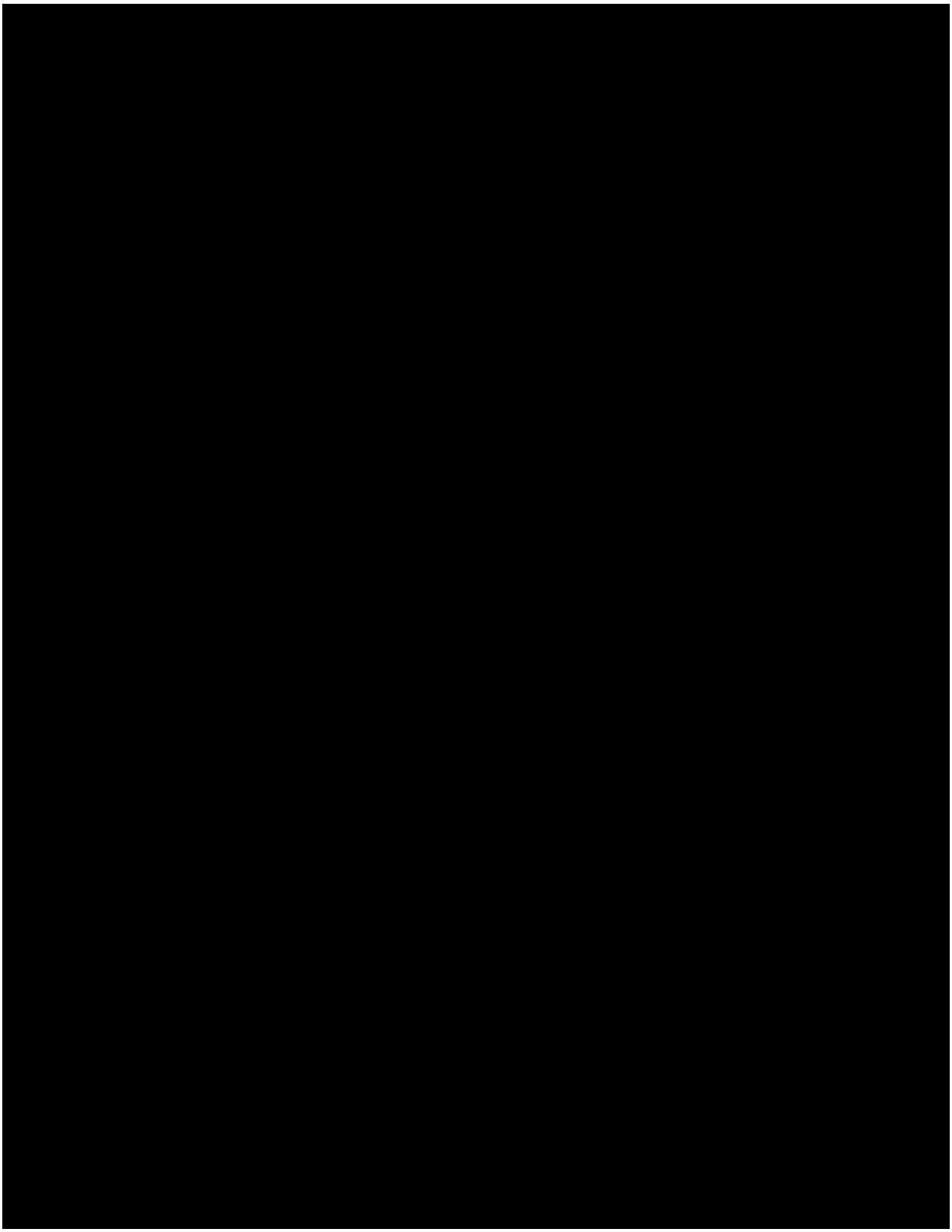
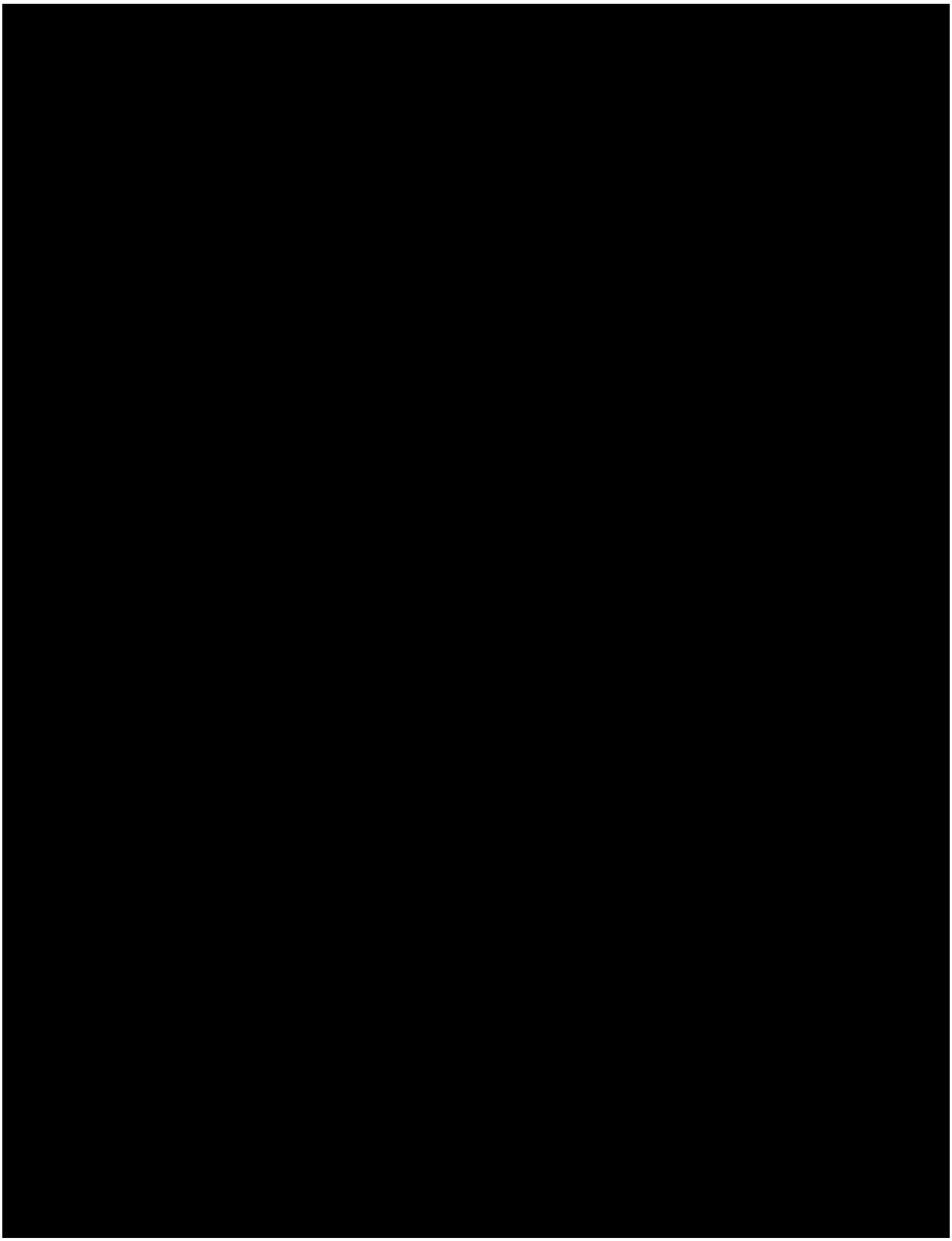


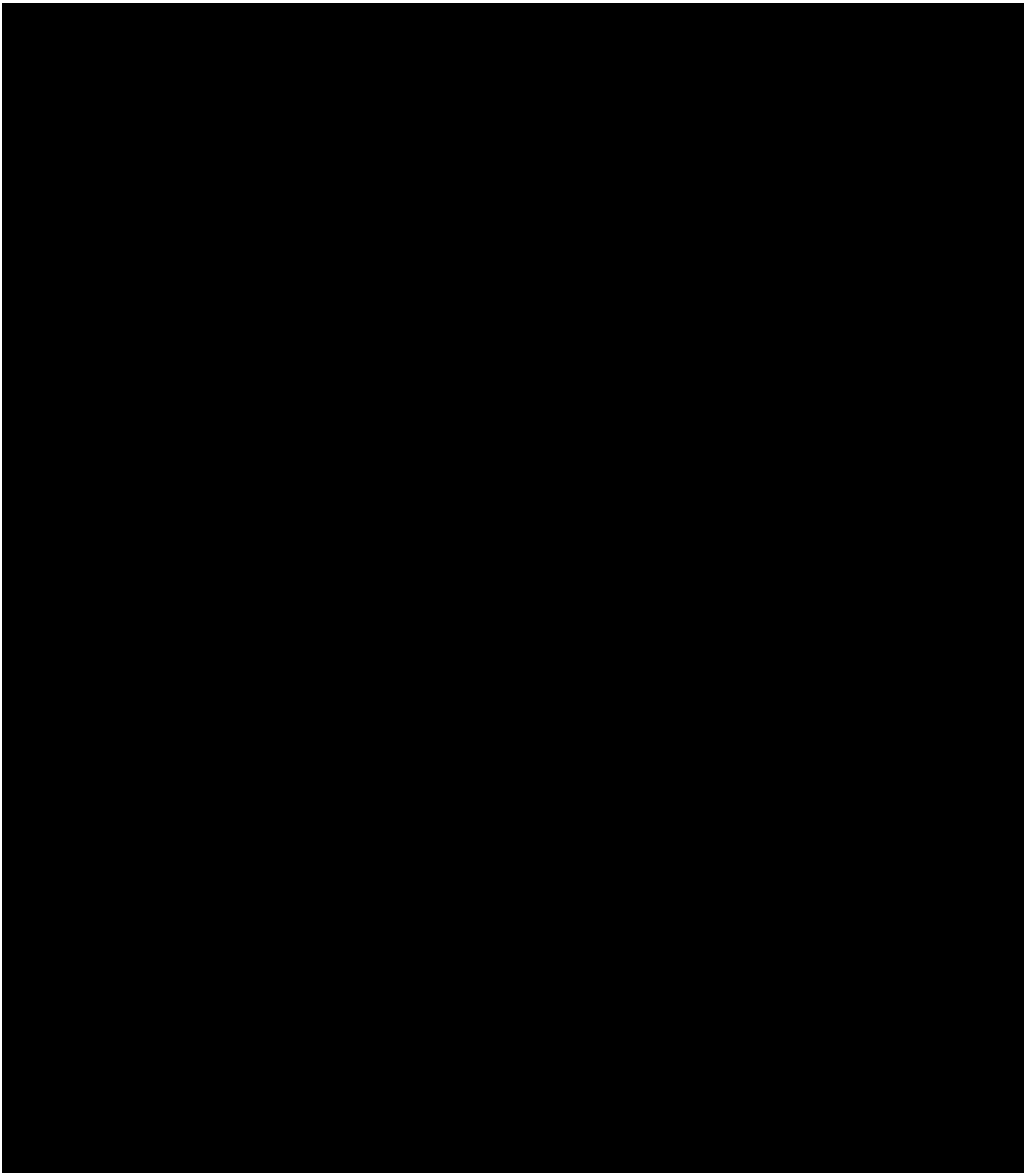


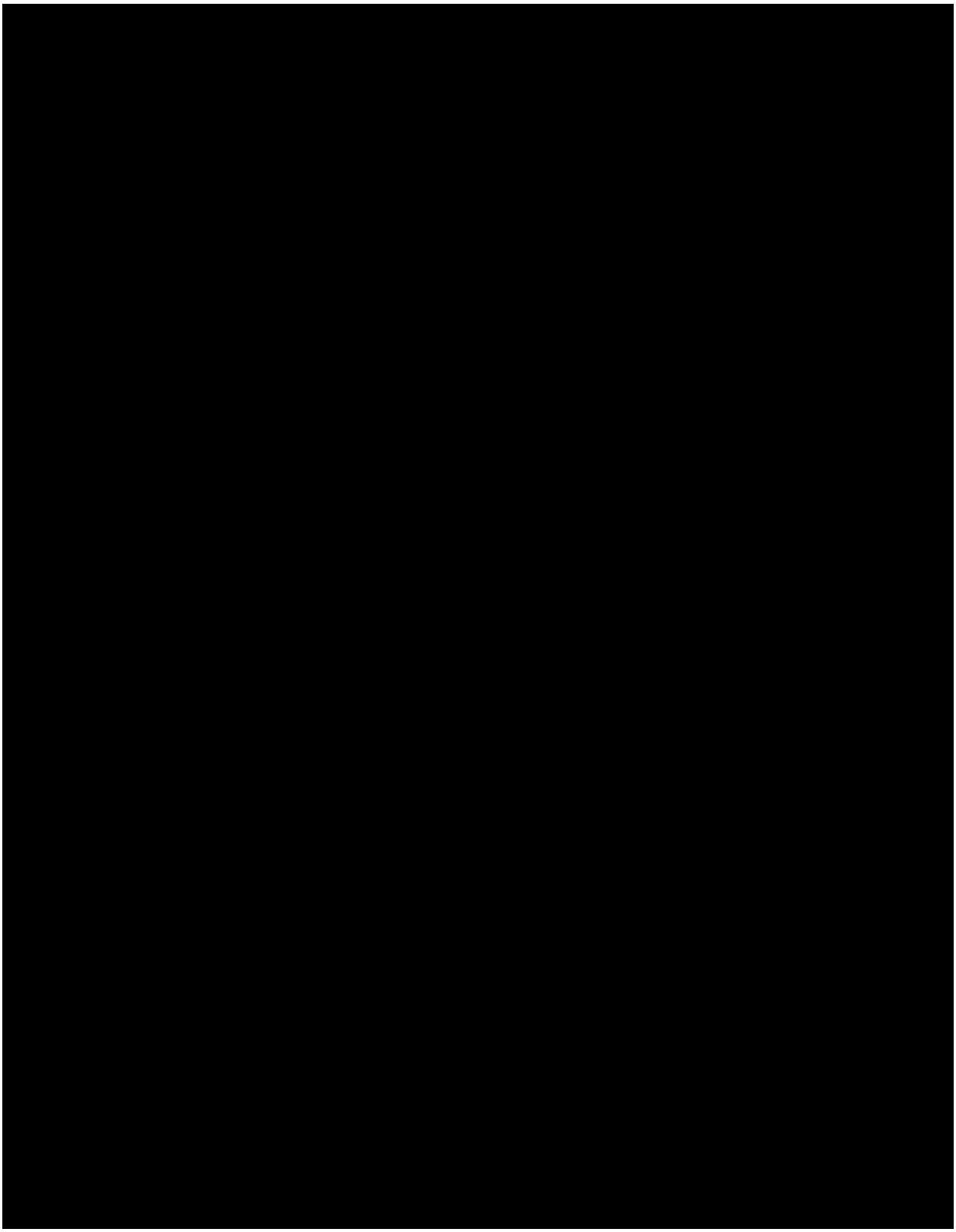


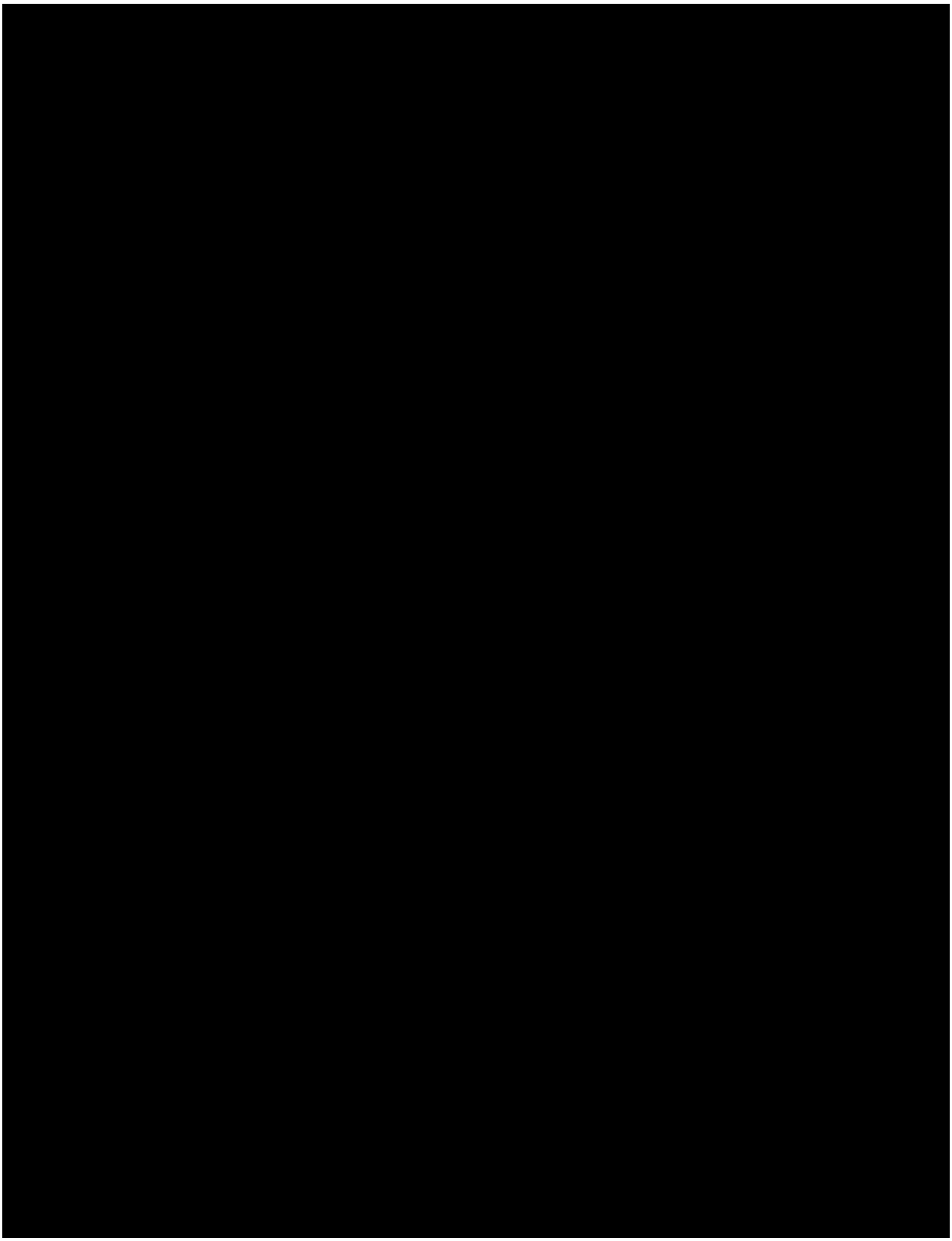


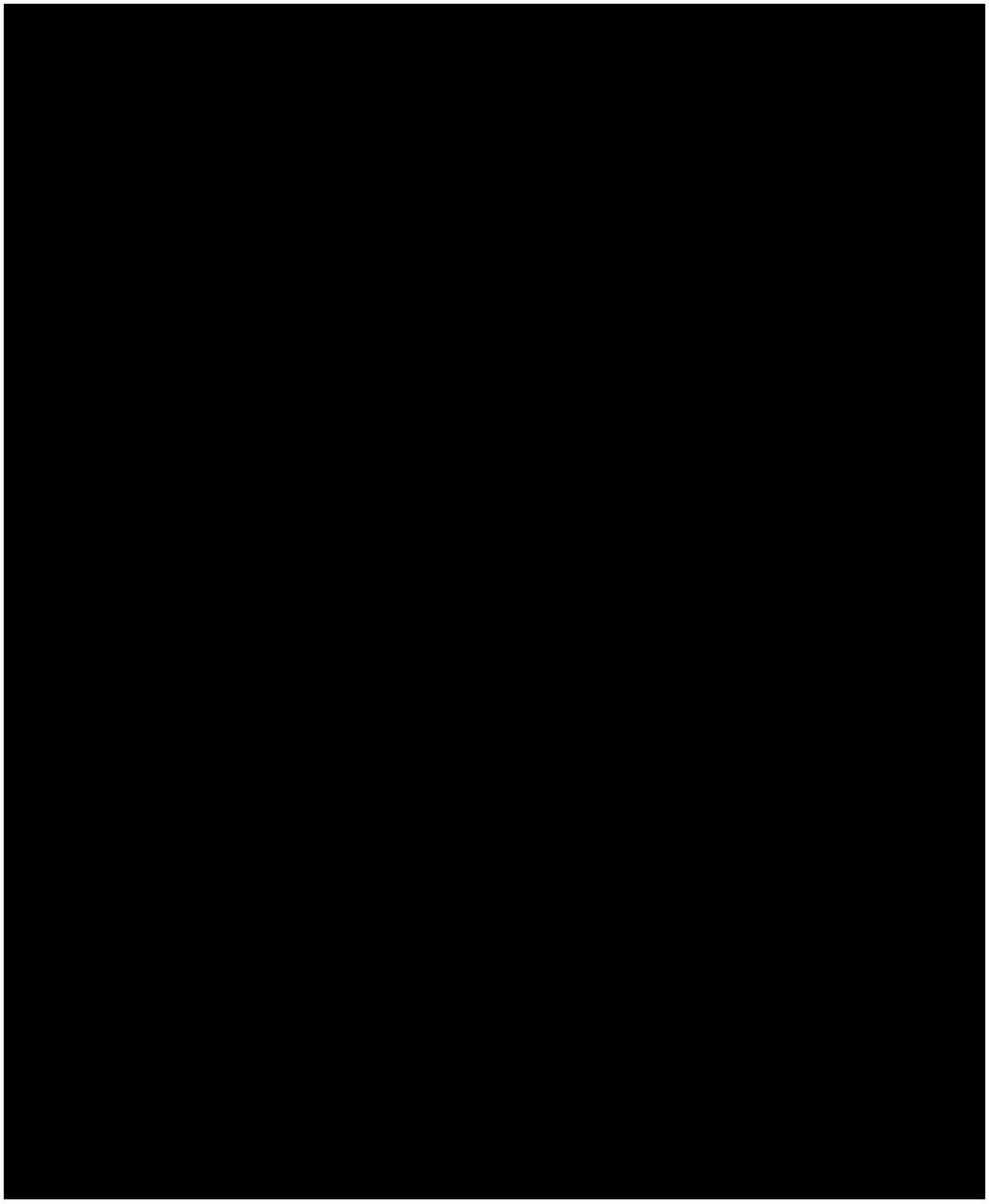












Aerial Photography and Orthophotography - for Soil Survey[12]
(Overview of NAPP and NDOP)

Good imagery (aerial photography) is critical for soil survey field mapping, as a base for map compilation and digitizing, and for hard copy map products. For those of us who have ever mapped soils - or, for that matter, produced any other natural resource inventory - we know that the imagery we are using can be our best friend, or our most frustrating nightmare.

The National Aerial Photography Program (NAPP) and the National Digital Orthophotography Program (NDOP) are the primary sources of aerial photography and (digital) orthophotography for the National Cooperative Soil Survey. Today, I will give you a brief overview of these two national programs.

NATIONAL AERIAL PHOTOGRAPHY PROGRAM (NAPP)

Let us first look at NAPP. The primary source of film to produce orthophotography comes from NAPP --- the National Aerial Photography Program ... What I call "Putting Film in the Can"...NAPP is also the primary source of rectified field imagery for soil survey mapping across the Nation.

NAPP imagery is flown at 20,000 feet above mean terrain --- in a North-Sough direction, - .. and, Quarter-Quad Centered. Ground controls use the UTM Coordinate System, and the 1983 North American Datum (NAD 83) as References.

NAPP is funded and administered primarily by five Federal agencies. State participation is encouraged, and is also an important aspect of funding. Currently, the Natural Resources Conservation Service (NRCS), Farm Service Agency (FSA), U. S. Forest Service (FS), National Agricultural Statistics Service (NASS), and the U. S. Geological Survey (TJSGS) are the principle Federal funding agencies. They also comprise the NAPP Steering Committee. Contracting for flights is to the private sector, and is administered by the USGS.

Imagery has been flown under NAPP for several years. Nationwide coverage has been completed under NAPP 1 (87-9 1) and NAPP 11 (92-96), and we are currently into the NAPP in cycle (97-03) - using a 7 Year Acquisition Plan.

NATIONAL DIGITAL ORTHOPHOTOGRAPHY PROGRAM (NDOP)

NAPP film is the primary source for producing ortho. Beginning in 1993, the techniques and procedures, and standards and specifications for producing orthophotography "digitally" were completed by USGS. Since that time ALL ortho produced under the NDOP has been digital. A Digital Orthophotograph (DOQ) is a digital (vs analog) representation of an aerial photograph or other remotely sensed data with ground features located in their true map positions.

NDOP was chartered in July 1993. The NDOP Steering Committee is composed of some of the same Federal Agencies as NAPP (NRCS, FSA, FS, & USGS), and also includes the National States Geographic

[1] *"Aerial Photography and Orthophotography - for Soil Survey"* (Overview of the National Aerial Photography Program (NAPP) and the Digital Orthophotography Program (NDOP), James H. Ware, Soil Scientist, Soil Survey Division, NRCS, Washington, DC. Presented at the Western Regional National Cooperative Soil Survey Conference, Wyndham Garden Hotel, Albuquerque, NM, June 15-19,1999.

Information Council (NSGIC). Contracting for DOQs is primarily to the private sector, and is administered by the USGS. Other Federal agencies, as well as States participation, is also a vital aspect of NDOP. The NDOP goal is to produce DOQ coverage of the Conterminous U.S. by the year 2002.

Not surprisingly, many technical standards and specifications are the same as those for flying NAPP film ... i.e., NAPP imagery is the primary source film, Quarter Quad format, UTM Coordinates and NAD 83 References. Technical specifications are endorsed by the Base Cartographic Data Subcommittee of the Federal Geographic Data Committee (FGDC), and the DOQs are archived as part of the National Spatial Data Infrastructure (NSDI) Framework Data Base.

The NDOP Steering Committee provides oversight and technical leadership to the program. The NDOP goal is to complete DOQ coverage of all private lands of the Conterminous U. S. by the year 2000, and all Federal lands by 2002. Driving forces affecting achievement of this goal include: 1) NAPP coverage- "film in the can" 2) Available funds - Federal and State agencies 3) DOQ costs 4) USGS and other agency cost-share policies and Joint Funding Agreements.

In March 1997, the USGS and the NDOP Steering Committee developed a revised funding policy. This new policy was precipitated by the need to identify requirements and cooperative agreements to achieve national NDOP goals in a timely manner, and more importantly, by the fact that FSA identified $22 million at the end of FY 96 to be used for DOQ acquisition to facilitate implementation of GIS technology in USDA Farm Service Centers.

Base operating assumptions for the revised funding policy is that NRCS and FSA will cost-share only on private lands (some exceptions for soil survey to honor MOU agreements), and that the USGS will fully fund DOQ acquisition on DOI *high priority* areas. Additionally, USGS will cost-share up to 1/3 of the cost on DOQ coverage of 200 or more contiguous quarter quads, and only 1/4 of the costs for NRCS and FSA requirements of less than 200 contiguous quarter quads. USGS will cost-share equally for DOQs over public lands not identified as DOI *high priority* areas. FSA agreed to match USGS policy, but only for imagery that is 1994 or more recent.

There are over 216,600 quarter quads (DOQs) in the "Lower “48”. As of May 1998, 33% are complete, and another 38% have been funded for "In-Work" production. I estimate the total --- Complete and In-Work --- to approach 70-75% by the end of this fiscal year.

NATIONAL AERIAL PHOTOGRAPHY PROGRAM

SLIDE 1 NAPP

NATIONAL AERIAL
PHOTOGRAPHY
PROGRAM

(NAPP)

"Putting Film in The Can"

SLIDE 2 NAPP SPECIFICATIONS (Highlights)

NAPP
SPECIFICATIONS

- Flown 20,000 Feet Above Mean Terrain (1:40,000 Nominal Scale)
- North-South Direction
- Quarter Quad Centered (3.75 x 3.75 Lat. and Long.)
- References—UTM Coord: NAD 83
- Nominal 60% Forward Lap and 30% Side Lap
- Considerations—Sun Angle, Clouds, Ground Cover

SLIDE 3 NAPP OVERVIEW

NAPP OVERVIEW

- Funded by Federal Agencies (NRCS, FSA, FS, NASS, USGS)
- NAPP Steering Committee
- State Agency Participation
- Administered by USGS
  Contracted to Private Sector
- Considerations --- Funding
  Film Type (B&W vs CIR)
  Flying Season
- 7 Year Cycle

SLIDE 4 NAPP 7 YEAR ACQUISITION PLAN
(Color Map of U.S.)

SLIDE 5 NAPP I (1987 - 1991)
(Color Map of U.S.)

SLIDE 6 NAPP II (1992 - 1996)
(Color Map of U.S.)

SLIDE 7 NAPP III (1997 – 2003)
(Color Map of U.S.)

NATIONAL DIGITAL ORTHOPHOTOGRAPHY PROGRAM

SLIDE 8 DIGITAL ORTHOPHOTOGRAPH

DIGITAL ORTHOPHOTOGRAPH
A DIGITAL (vs Analog)
REPRESENTATION OF AN
AERIAL PHOTOGRAPH OR
OTHER REMOTELY SENSED
DATA WITH GROUND
FEATURES LOCATED IN THEIR
TRUE MAP POSITIONS

SLIDE 9 NDOP

NATIONAL DIGITAL
ORTHOPHOTOGRAPHY
PROGRAM
(NDOP)

Conversion from ANALOG
to DIGITAL ORTHO
1993

SLIDE 10 DOQ TECHNICAL CHARACTERISTICS (Highlights)

DOQ TECHNICAL
CHARACTERISTICS

- Specifications Endorsed by Base Cartographic Data Subcommittee of FGDC
- Source Imagery—NAPP
- Georeferenced – 1 Meter Ground Sample Distance
- Meets National Map Accuracy Standards for 1:12,000 Scale (± 33 feet)
- Centered on 3.75’ x 3.75’ Geographic Cell
- UTM Coordinate System—NAD 83 Datum
- Ancillary Product is DEM
  --USGS Sells Soft Copy Only
- Archived – Part of *NDSI Framework* Data Base

SLIDE 11 NDOP OVERVIEW

NDOP OVERVIEW

- NDOP Steering Committee
  Chartered July 1993
  (Program Oversight & Technical Leadership)
- Membership
  NRCS, FSA, FS,USGS, NSGIC (National States Geographic Information Council)
- Administered by USG---Contracted to Private Sector

- Other Federal/State Participants

SLIDE 12 DOQ ACQUISITION—Driving Forces

DOQ ACQUISITION-
Driving Forces

- NAPP – "Film in the Can"
- FUNDS – NRCS, Others
- NRCS PRIORITY POLICY (SSURGO, Soils, JFA)
- COST SHARE POLICY—USGS, FSA
- DOQ COSTS
- OTHER AGENCIES—(Federal, State, County)

SLIDE 13 USGS FUNDING POLICY – Federal Partners (3/97)

USGS FUNDING POLICY –
Federal Partners
(3/97)

- DRIVING FORCES:
  --Facilitate identification of requirements and cooperative agreements to achieve national goals in timely manner
  --FSA--$22 million end of FY 96
- OPERATING ASSUMPTIONS
  for NDOP Subcommittee:
  --NRCS/FSA Cost-share Only on Private Lands
  --USGS Fully Fund DOQs on DOI High Priority Areas
  --NDOP Goal: DOQs on Private Lands by 2000; Public Lands by 2002

SLIDE 14 USGS FUNDING POLICY – Federal Partners (cont.)

USGS FUNDING POLICY –
Federal Partners (cont.)
(3/97)

- USGS COST SHARE
  --1/3 FOR Full or Partial State DOQ
  Coverage of 2000 or More Contiguous Quarter Quads
  --1/4 for NRCS and FSA Requirements of
  less than 200 Contiguous DOQs
  --Cost-share Equally for DOQs over
  Public Lands—NOT DOI High Priority

- FSA COST-SHARE with NRCS
  --Match USGS Policy, FOR 1994 or Newer Imagery

SLIDE 15 DOQ COSTS

DOQ COSTS
3/97

- B & W QUARTER QUADS (DOQ)
  $1,020

- CIR QUARTER QUAD (DOQ)
  $1,420

SLIDE 16 DIGITAL ORTHOPHOTO QUADRANGELS (May 1998)
(Color Map of U.S.)

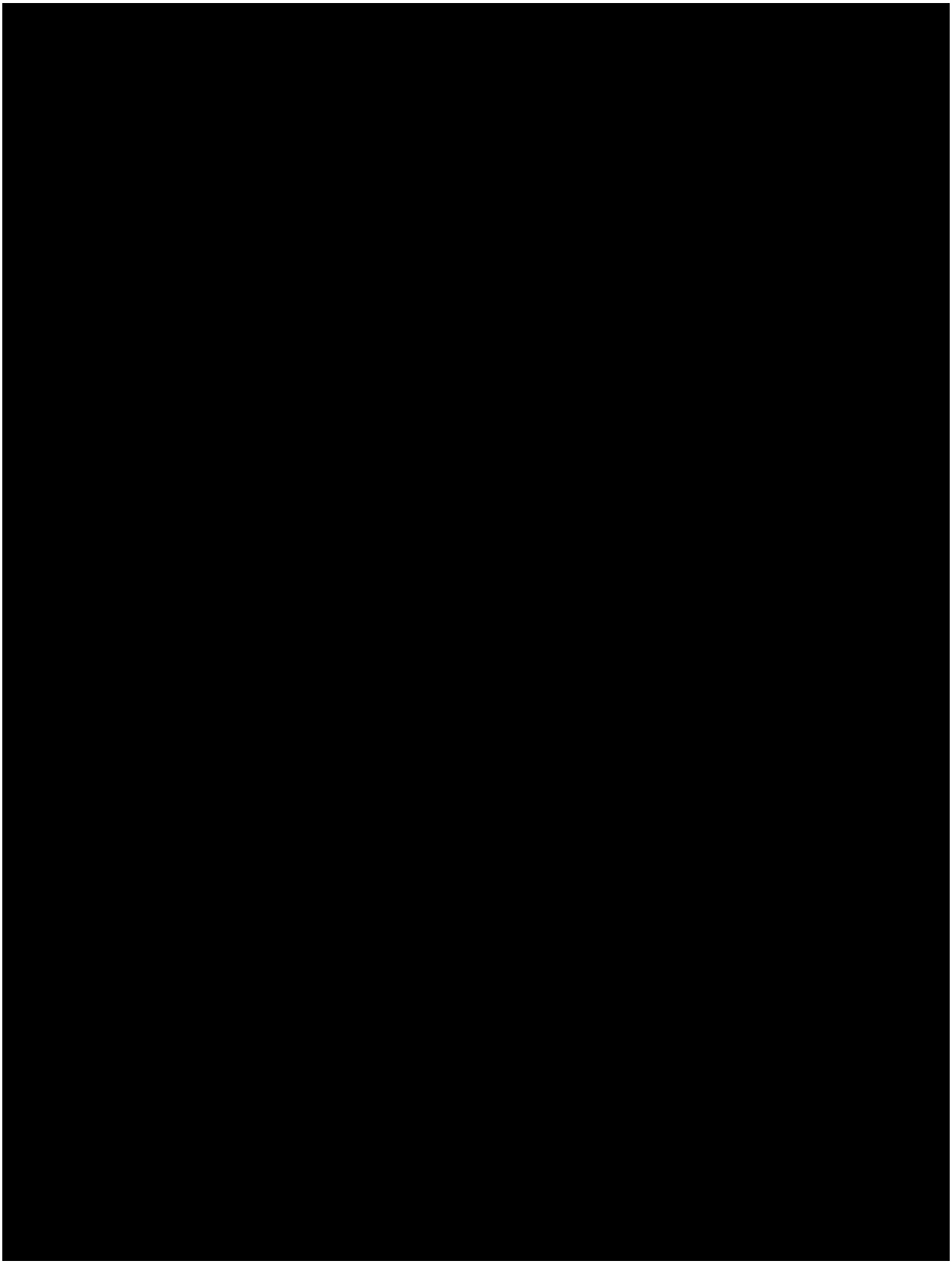
SLIDE 17 DOQ STATUS (Graphic—Pie Chart)

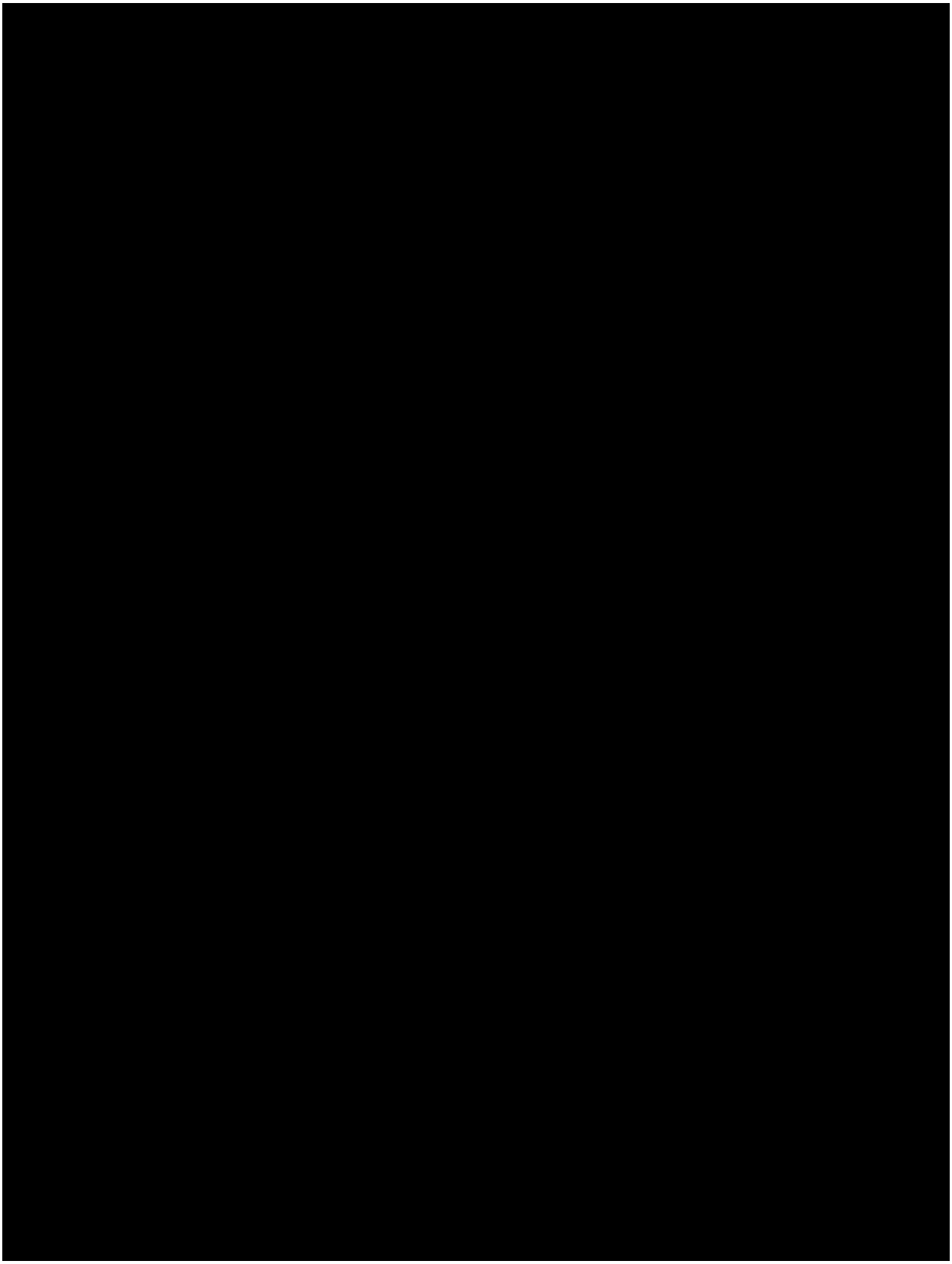
MAY 1998

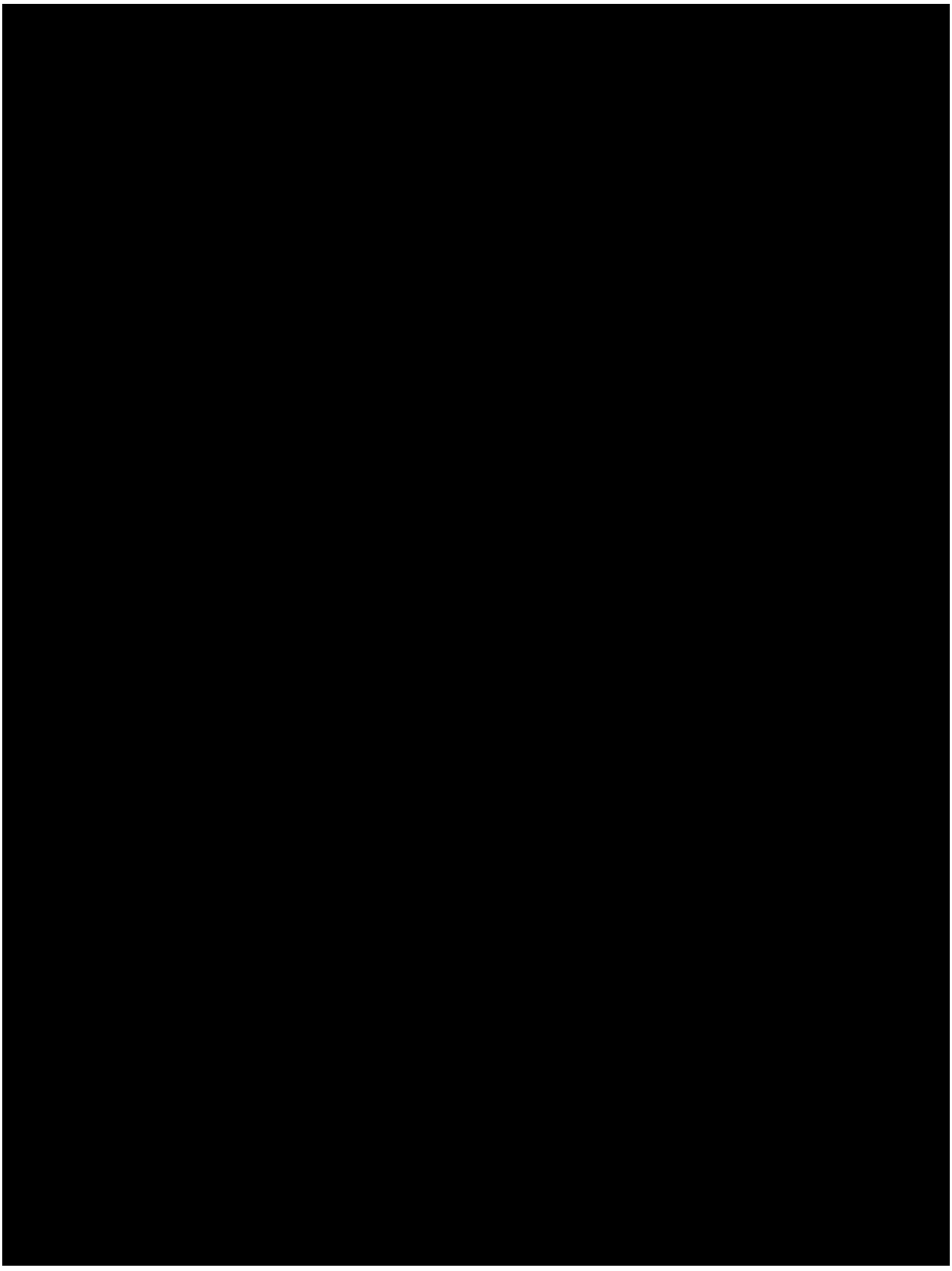
COMPLETE	33%
IN-WORK	38%
NOT ORDERED	29%

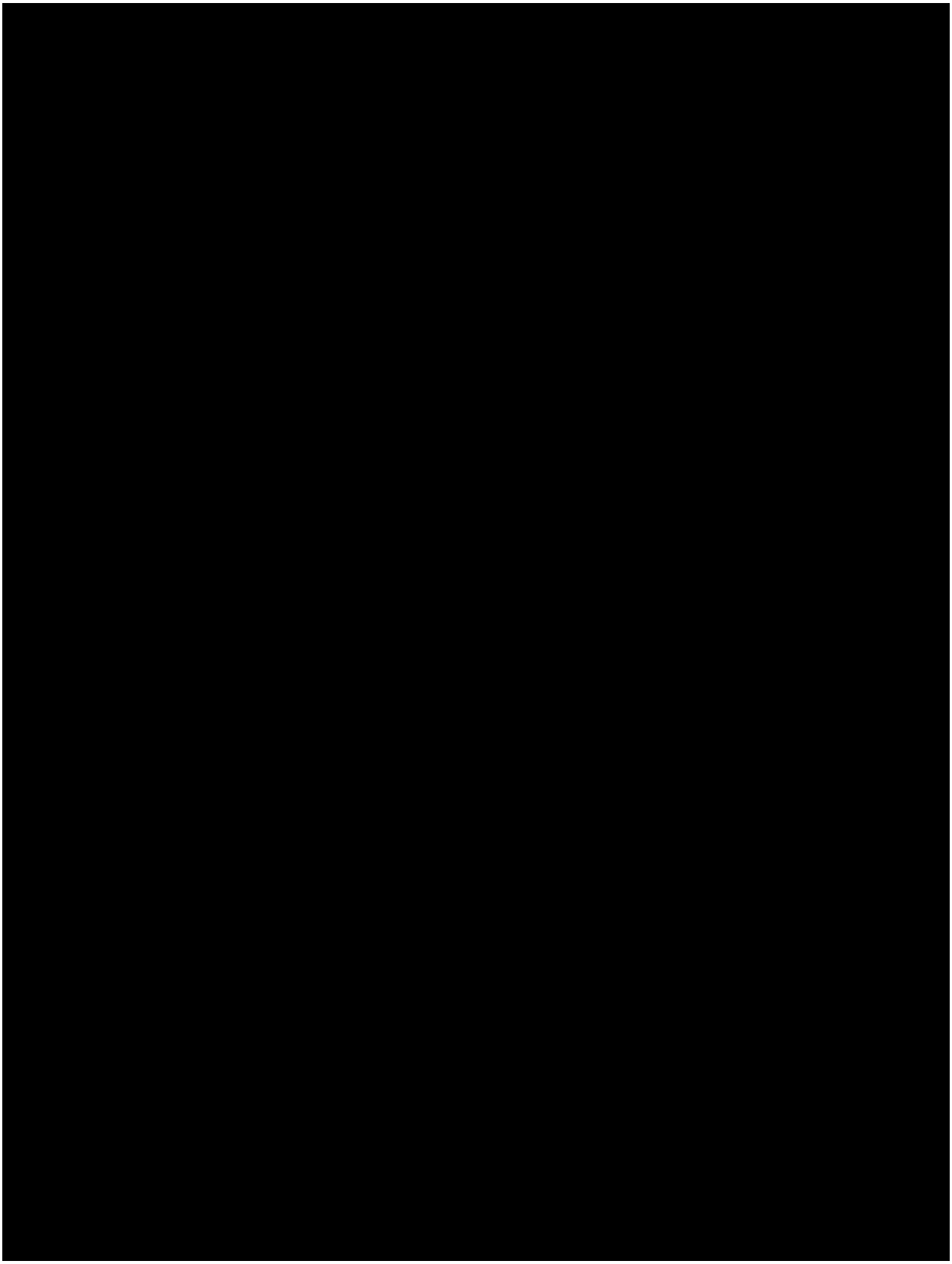
SLIDE 18 DOQ STATUS (Graphic-Bar Graph)

	May 97	May 98
COMPLETE	24%	33%
IN-WORK	31%	38%
TOTAL	55%	71%





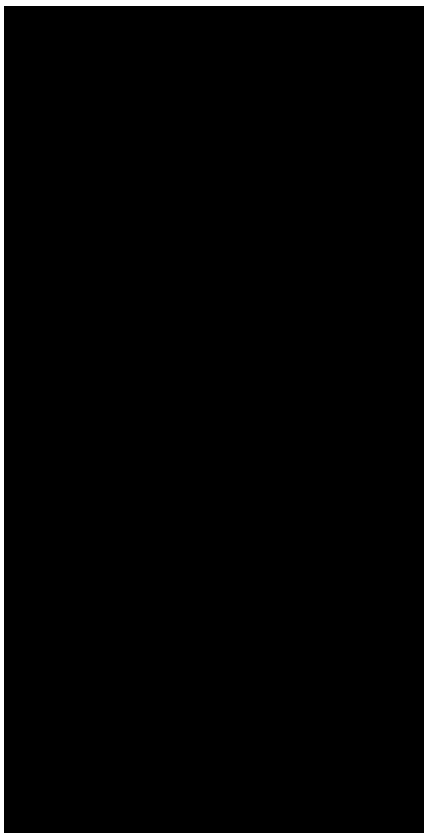




National Cooperative Soil Survey

Western Regional Conference

June 14-19,1998



Wednesday June 17,1998

Western Regional Cooperative Soil Survey Conference

Sponsored By
New Mexico Chapter of the Soil and Water Conservation Society

Field Tour Guide

June 17, 1998

TABLE OF CONTENTS

Western Regional Cooperative Soil Survey Conference
Field Tour

Agenda

Stop 1. Cibola National Forest - Fire Ecology of Grasslands

Dr. Sam Loftin, USDA-FS, Rocky Mountain Forest and Range Experimental Station, Albuquerque, NM

Dr. Carl White, University of New Mexico, Albuquerque, NM

Stop 2. Bandelier National Monument - Pinyon/Juniper Ecology

Dr. Craig Allen, USDI-Geological Survey, Jemez Field Station, Los Alamos, NM

Mr. Richard Gatewood, USDI-Bandelier National Monument, Los Alamos, NM

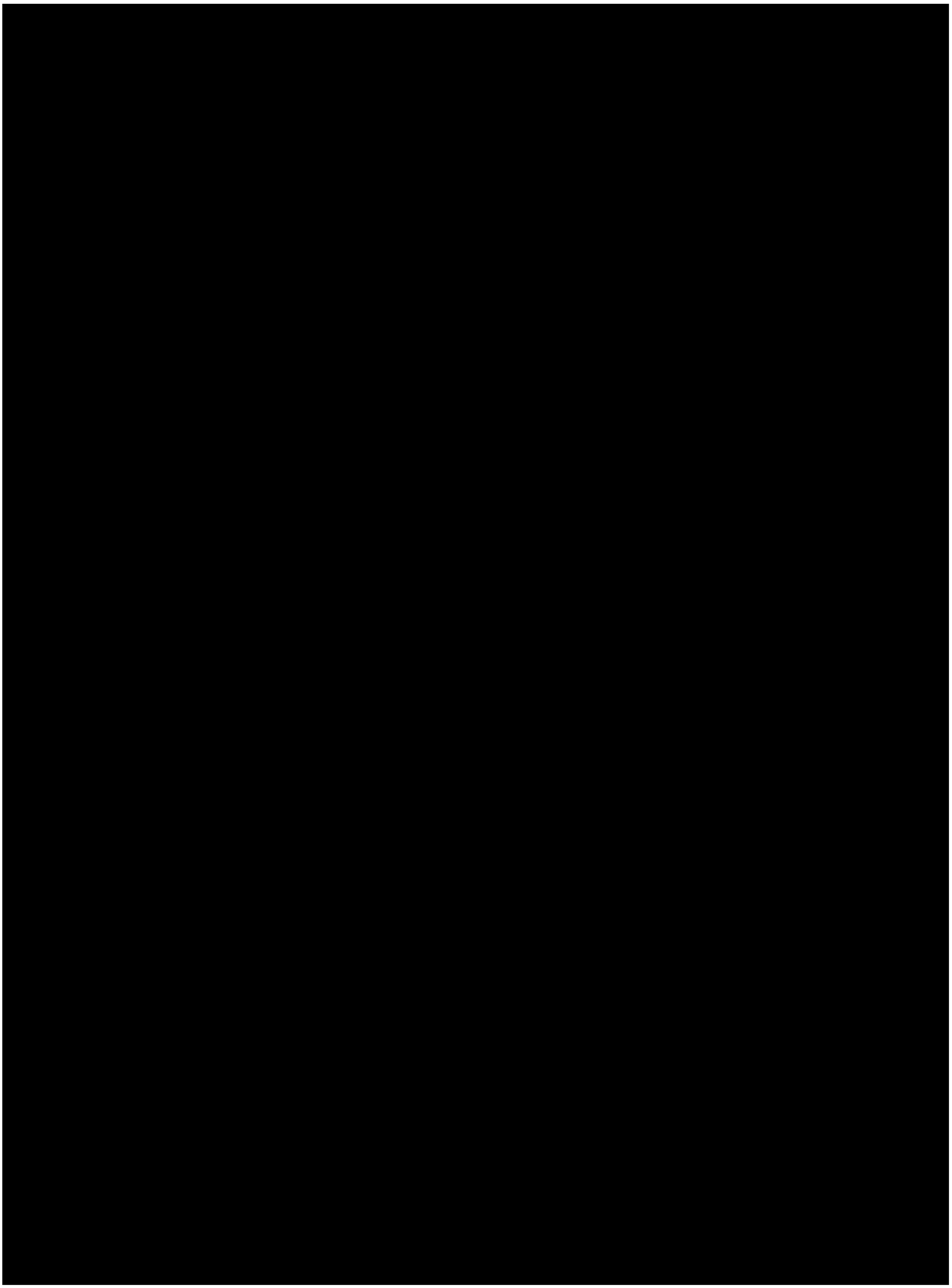
Stop 3. Santa Fe National Forest - Dome Wildfire Effects & Rehab

Ms. Rita Smoots-Skinner, USDA-FS, Santa Fe National Forest, Jemez Springs, NM

Mr. Steve McWilliams, USDA-FS, Santa Fe National Forest, Santa Fe, NM

Stop 4. Valle Grande - Baca Location
Proposed Land Acquisition

Ms. Ria Smoots-Skinner, USDA-FS, Santa Fe National Forest, Jemez Springs, NM



Response of Vegetation, Soil Nitrogen, and Sediment Transport
to a Prescribed Fire in Semiarid Grasslands.

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Abstract. Shrubs and trees have invaded semiarid grasslands throughout much of the Southwestern United States. This invasion not only has decreased grass cover, but also increased runoff and erosion. In fact, sediment from rangelands constitutes the single largest source of non-point stream pollutants within the state of New Mexico. Fire, which was a natural factor that shaped and maintained the grasslands, is a management tool that may aid in restoring and maintaining grass cover. However, fire also poses the risk of increasing erosion and further degradation because protection afforded by vegetation is reduced immediately after the fire. Using a randomized block study design, this study measured vegetation cover, soil inorganic nitrogen (N) levels, and erosion amounts associated with the first application of prescribed fire on two semiarid grasslands. The potential for adverse effects from these fires was great because they were performed at the beginning of a drought period. After the first growing season following the fire, grass cover returned to pre-burn levels, and both soil N and erosion amounts were similar to the unburned areas. Thus, prescribed fire for reducing shrub and tree cover may pose minimal adverse risk even under drought conditions.

PLACITAS AND SANDIA CREST SOIL TEMPERATURE/MOISTURE MONITORING SITES

Four soil temperature monitoring sites were established in the Sandia Mountains during February of 1991. The purpose for monitoring is to verify the correlation of soil moisture and temperature regimes to various plant communities as defined by the USDA Forest Service Southwest Region's Terrestrial Ecosystem Survey climatic gradient analysis. Sites are located in a low elevation juniper woodland/grassland transition, a lower mid elevation pinon-juniper woodland, a mid elevation ponderosa pine forest and a high elevation spruce/fir forest indoor/outdoor themometers were used. The outdoor sensor was used to record soil temperature at a depth of 50cm at all four sites. Readings were taken once per month every month during the first year. Readings in following years were taken once during the months of June, July, August and December, January, February. During July of 1992, data pod soil temperature/moisture recorders were installed at the lower juniper site and at the upper spruce/fir site. These recorders were programmed to read soil temperature at a depth of 50cm and soil moisture at depths of 10 and 30 cm daily, at 5-minute intervals and store an average daily reading. Accuracy of the thermometers is + or - 2 degrees. For the data pods it is + or - 5% of the reading. The following summarizes the data collected thus far.

JUNIPER WOODLAND/GRASSLAND TRANSITION, 5600 FEET ELEVATION

Temperature

Temperature data collected by both thermometers and data pods indicates a borderline thermic temperture regime. Mean annual soil temperature is 15.1 degrees C, which barely makes it as thernic. The difference between mean summer and mean winter soil temperature is 21.3 degrees C which meets the

criteria for both themic and mesic temperature regimes. The Southwest Region's gradient analysis calls for a mesic soil temperature regime in juniper woodlands and a thermic regime in grasslands.

Moisture

Data collected reflects an ustic moisture regime. Some part of the soil moisture control section was dry for 90 or more cumulative days or 25% of the time in most years. Soil temperature tends to be above 5 degrees C during the months of February through November or for 303 days of the year. The soil averaged 55 days per year where it was dry in all parts of the moisture control section during the time soil temperature was above 5 degrees C. This meets the criteria of being not dry in all parts of the moisture control section for more than 1/2 of the cumulative days where the soil temperature is above 5 degrees C. The Southwest Region's gradient analysis calls for an ustic moisture regime in both juniper woodlands and grasslands with the grasslands having an aridic subgroup. The soil averaged being dry for .4 of the cumulative- days per year when the soil temperature was above 5 degrees C. For an aridic subgroup .6 is required. The Soutwest Region's gradient analysis calls for an ustic moisture regime with a typic soil subgroup for juniper woodlands. Grasslands are in an ustic moisture regime with an aridic subgroup.

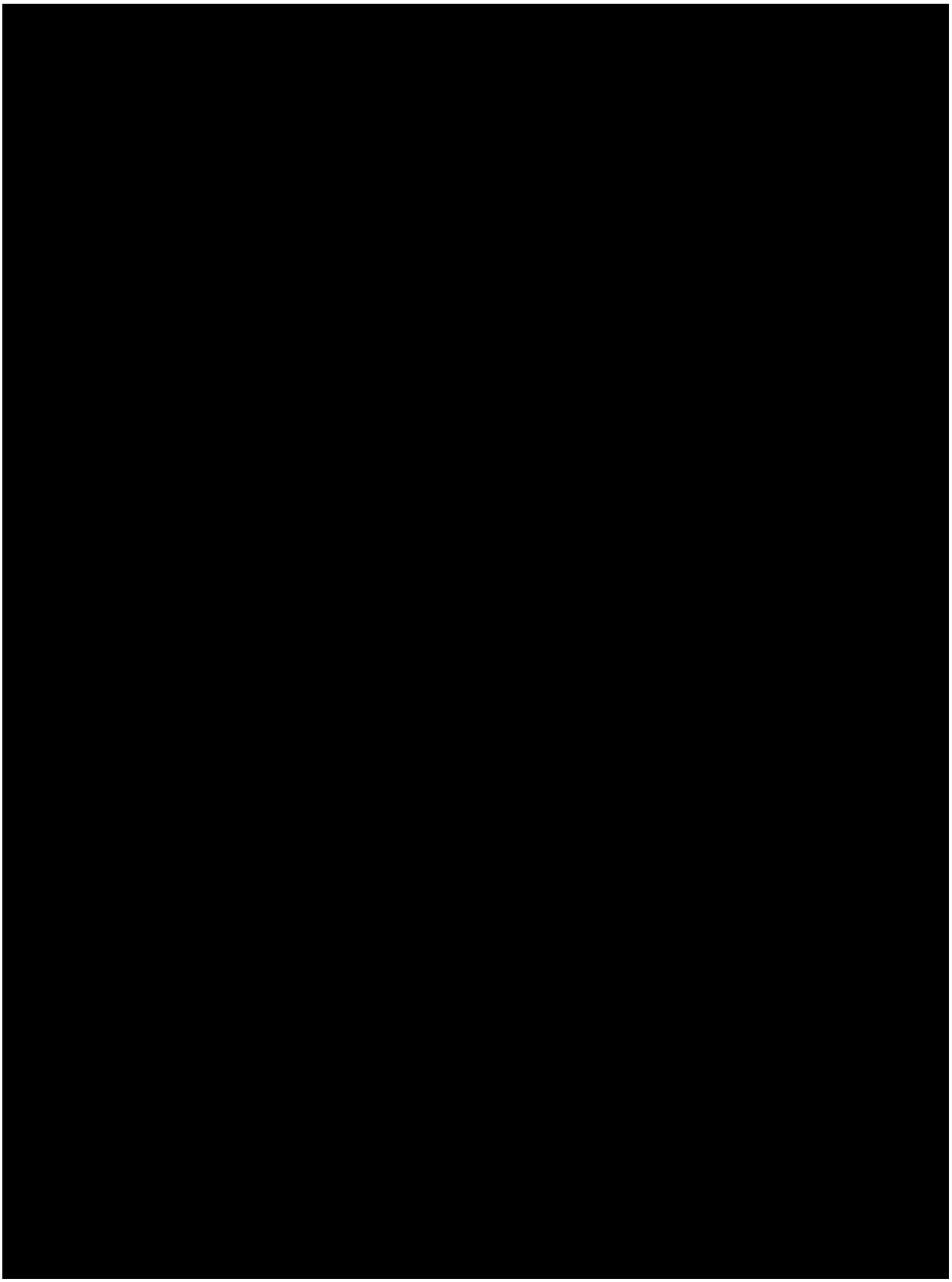
SPRUCEIFIR FOREST, 10,500 FEET ELEVATION

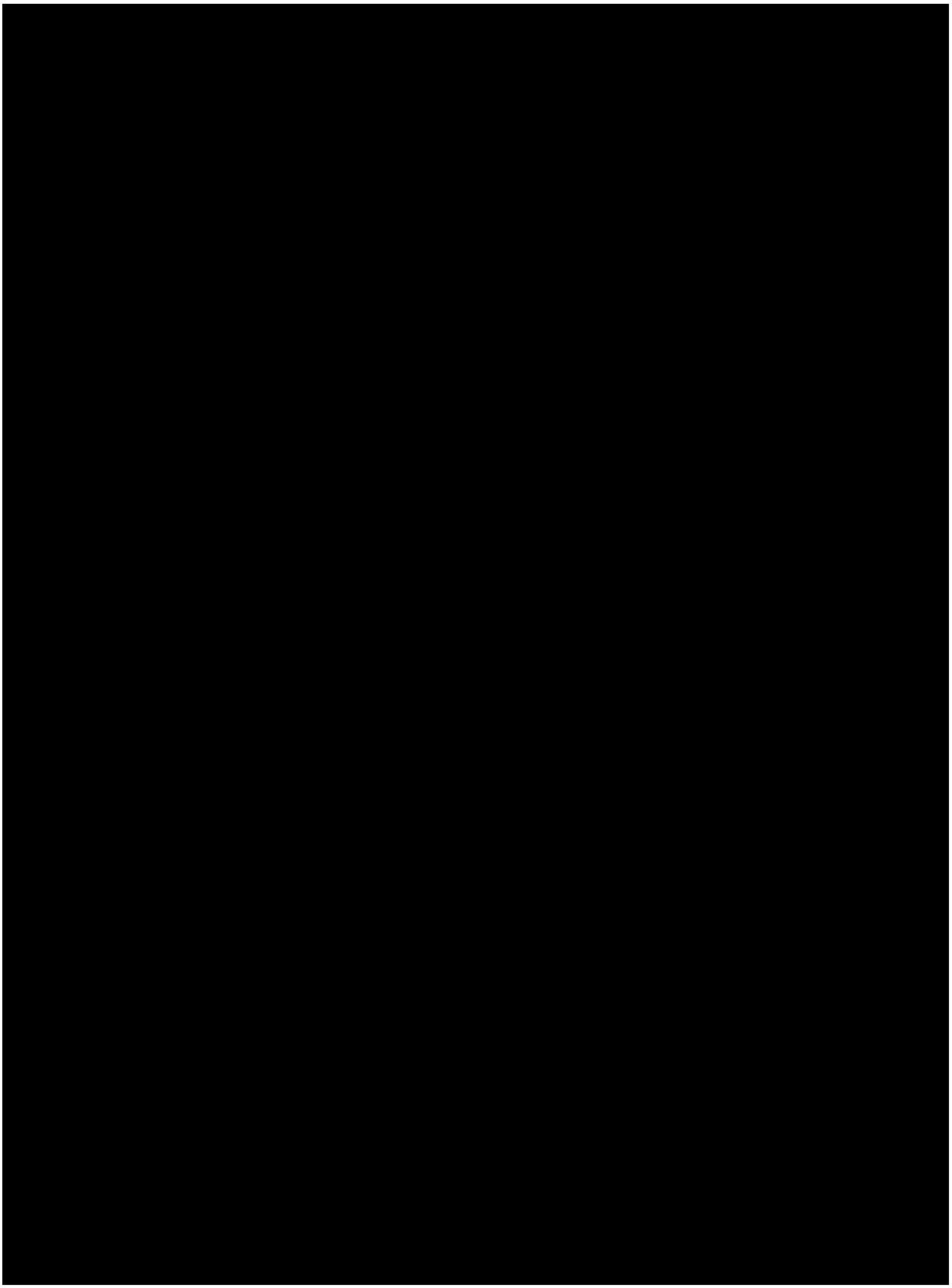
Temperature

Temperature data collected indicates a cryic temperature regime. Mean annual soil temperature is 3.1 degrees C. Mean summer soil temperature is 6.6 degrees C. Cryic criteria calls for a mean annual soil temperature of between 0 and 8 degrees C and a mean summer soil temperature of less than 8 degrees C. Spruce/fir forest is the break where the soil temperature regime goes from frigid to cryic in the Southwest Region's gradient analysis.

Moisture

Soil moisture data indicates an udic moisture regime. The soil averaged 304 days per year moist in all parts of the moisture control section. This meets the criteria of being not dry in the moisture control section for as long as 90 cumulative days per year. The soil was also dry for less than 45 consecutive days following the summer solstice. The Soutwest Region's gradient analysis calls for a udic moisture regime in spruce/fir forest





Bandelier National Monument

Prehistoric ruins at Bandelier occupy a canyon cut by the Frijoles River in volcanic tuff once the ashy outpouring of explosive volcanic eruptions that almost completely demolished the large volcano from which they came.

Only the base of the Jemez volcano, which existed here about a million years ago, now remains--the rim of the Valles Caldera at the center of the Jemez Mountains. Like many other New Mexico volcanoes, the Jemez volcano rose along faults that edge the west side of the Rio Grande Rift. With alternate layers of thick lava and ash, results of alternating fairly quiet and quite explosive eruptions, the mountain was a composite volcano, probably of the shape and size of Mt. St. Helens before its 1980 eruption. It rose above a base of older volcanic rock, some of which can be seen in the lower gorge of the Frijoles River. A little more than a million years ago it reached its maximum height.

Shortly after that, about one million years ago, the volcano burst forth with two extremely violent eruptions, spewing out incredible volumes of volcanic gases, ash, pumice, and broken rock. The Mt. St. Helens 1980 eruption was child's play by comparison: The Jemez: eruptions released more than 50 cubic miles of rock material--roughly 100 times that discharged by Mt. St. Helens!

Ash clouds drifted as far as Iowa, Oklahoma, and Texas. Other ash sped down the flanks of the volcano in incandescent avalanches that finally came to rest far down on the mountain slopes. Still very hot, the incandescent particles welded together, forming a firm yet porous rock. The ash flows of the second great eruption now form the Bandelier tuff that walls Frijoles Canyon.

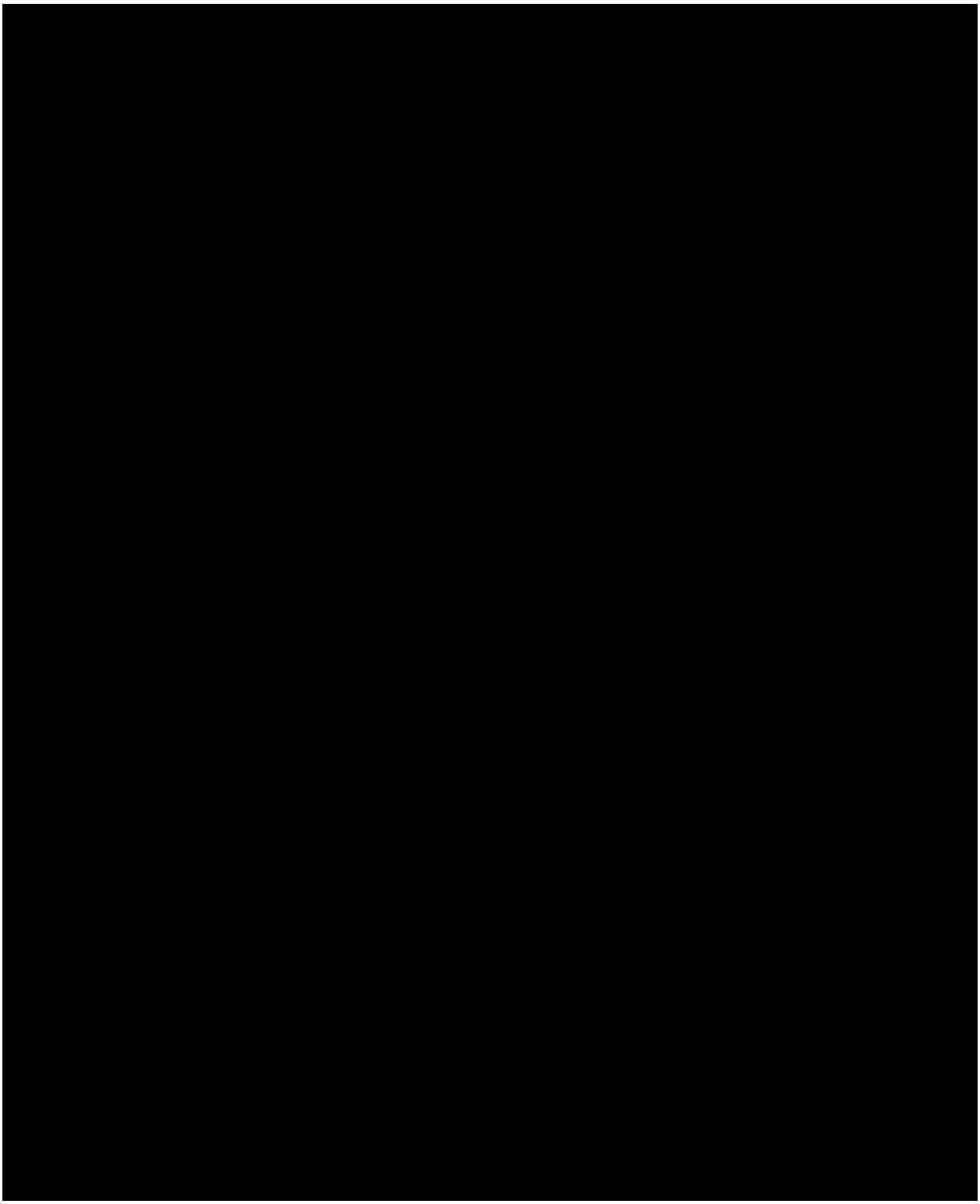
The explosions to some extent depleted the magma chamber far beneath the volcano. No longer supported from below, the mountain, ringed by fractures, collapsed. Its subsidence produced, at the surface, a vast caldera, an almost circular, cliff-ringed pit 14 miles across the Valles Caldera, not within the national monument but well worth a visit.

Much of the Bandelier tuff represents two thick layers of volcanic ash. Their upper and lower margins, where they cooled most rapidly, remained fairly soft and easily eroded; their centers, cooling slowly over many decades, became hard and resistant. Most of the soft upper part of the tuff has eroded away completely; the hard center of the upper ash flow forms the mesa surface around Frijoles Canyon.

Many features of the tuff can be seen near the ruins and along the trail downstream toward the Rio Grande. The rock is composed of bubbly fragments of volcanic ash, hard shards of volcanic glass, and irregular lumps of other volcanic material. In places it fills channels cut in older lava flows. Elsewhere it is studded with volcanic bombs rounded as they spun through the air.

On the whole, the tuff is weather-resistant, with a hard outer shell that developed as moisture sank into the rock, absorbed silica minerals from the tuff, and then was drawn to the surface and evaporated by warm sunshine and dry air. Scattered through the tuff are natural alcoves hollowed out by rain, wind, and snow; some of those near the ruins were enlarged by the pueblo-dwellers of Frijoles Canyon. In places weathering has followed vertical joints to the extent that conical rock forms locally known as "tent rocks" have developed. Tent rocks may also form by weathering where volcanic fumes rise through porous ash, cementing some of it more tightly.

Downstream from the ruins the canyon walls are composed of dark lava flows that predate the Bandelier tuff. The stream, struggling with this harder rock, has cut a narrower defile. Red-baked soil zones can be seen beneath individual flows, and little green olivine crystals appear in the basalt. Olivine basalt, known to have come from the Earth's mantle deep below the solid crust, tells us that the faults along which it rose-faults that edge the Rio Grande Rift--reach all the way through the crust.



From the standpoint of average annual precipitation, New Mexico is one of the driest of the fifty states. Fully 90 percent of the land surface averages less than 20 inches per year, 20-30 percent of the area of the state less than 10 inches. The largest averages, probably not greater than 35 to 40 inches, are limited to extremely small high-elevation areas in the northern mountains.

New Mexico receives meager amounts of precipitation partly because of its -inland location. To reach the state, moist air must travel from the Pacific Ocean off the west coast of the United States or Canada, from the Pacific off Mexico, or from the Gulf of Mexico. In each case moist air masses have a long trajectory over dry land areas, during which they lose much of their water vapor in precipitation from repeated uplift over high mountains and plateaus before reaching New Mexico. Also, most winter Pacific storms pass eastward across the western United States too far north to have much impact on the state. Then, too, much of the winter New Mexico is dominated by high pressure with subsiding air and stable lapse rates that inhibit storm development. Low pressure sits over New Mexico most of the summer, but it is thermal in origin; thus aloft over the surface low pressure there is high pressure and subsiding dry air. Thunderstorms can develop only when this condition weakens or disappears.

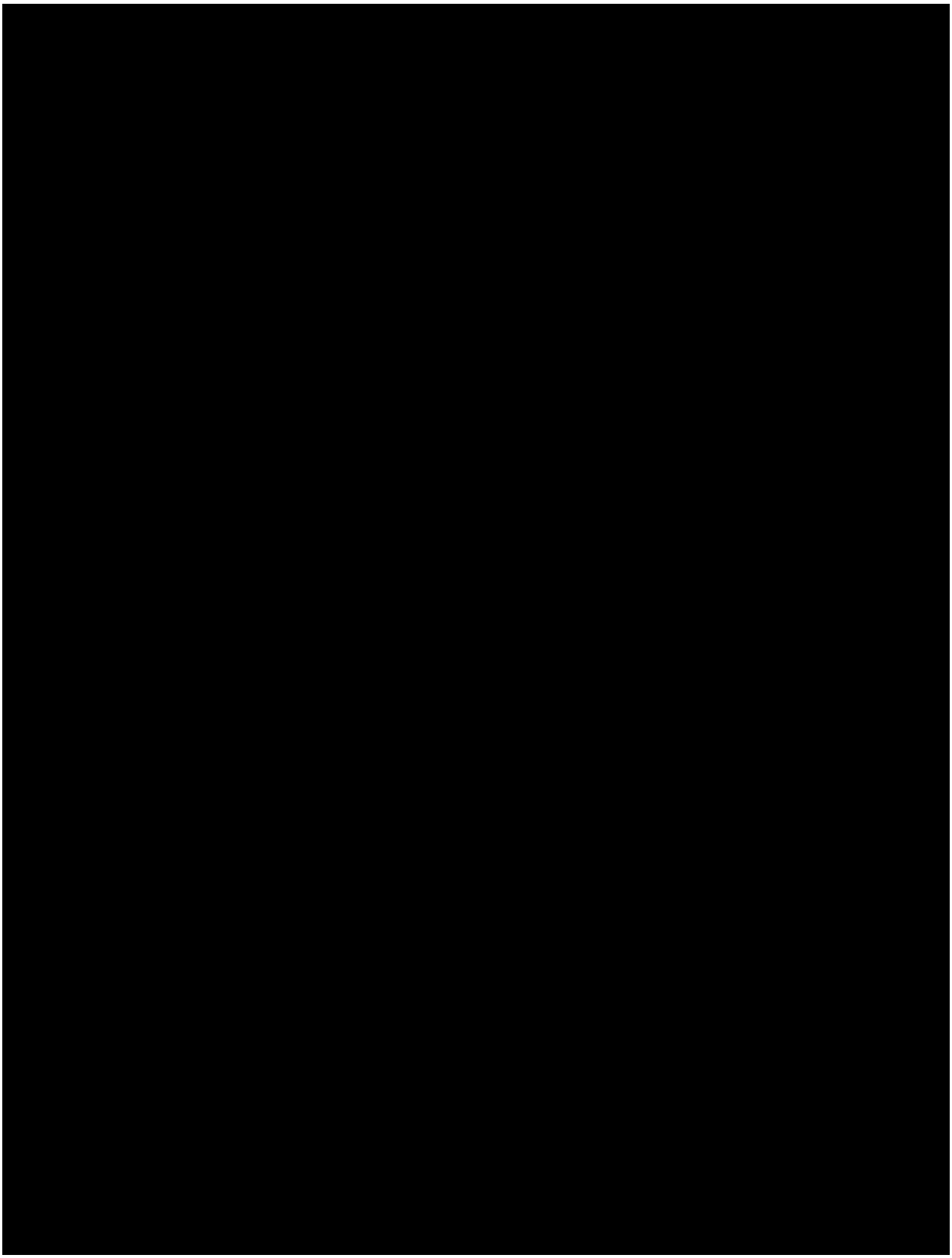
The isolines of average annual precipitation on the map indicate a strong relationship between surface terrain and precipitation: mountains and high mesas receive the most; low basins and stream valleys the least. This terrain-precipitation relationship is so important in New Mexico that an explanation of the type of rainfall is in order. The forced ascent (orographic uplift) of moist air and storm systems as they move across high areas and their descent into low areas are major causes. As a mass of air rises it expands in volume because surrounding air pressure always decreases rapidly with height. As air expands, its heat content is spread through a larger volume; thus the amount of heat per unit of volume (e.g., per cubic meter) decreases, causing the air temperature to cool. It the air rises high enough and cools enough, some of the water vapor will condense into liquid or ice crystal cloud particles. And if enough condensation occurs, many of the moisture particles will grow large enough to fall out of the cloud as some form of precipitation (snow, sleet, hail, rain). As air descends into low basins or valleys exactly the opposite occurs.

The heavier precipitation over high terrain is produced in three ways. In one scenario a large Pacific storm, in which precipitation is failing over many thousand square miles, moves across the state, orographic uplift of the system over high areas intensifies the storm process and increases precipitation. As the storm moves downslope into low areas, such as the Rio Grande Valley, it weakens and precipitation decreases or ceases entirely. In the second case moist air, in which no general storm is occurring, encounters a mountain or mesa edge and is forced to rise. If the air is unstable, it will continue to rise many thousand feet above the mountain or mesa top and generate a thunderstorm from which significant amounts of precipitation will fall. In the third process, known as the heat island or chimney effect, solar radiation absorbed by the mountain sides and top produces over these areas a layer of air which is warmer and lighter than air at the same elevation out over the nearby lower areas. The warmer air rises up the mountain side and, if unstable, possibly continues to rise high above the mountain top and results in a thunderstorm. This third process, often with an assist from the second, is believed to be the principal mechanism responsible for summer thunderstorms over the higher elevations of the state. It operates so frequently that the central mountains of New Mexico, from the Sacramentos in the south to the Sangre de Cristos in the north, are part of the area (which continues northward into Colorado) that averages more days with thunderstorms during summer than any other section of the United States.

A characteristic of dry climates is the large variation over a period of years in annual precipitation totals. In the table, note the wide range of annual values at each station during the thirty years 1951-80: from 6.4 inches in 1952 to 32.3 inches in 1960 at Clovis; or at Santa Rosa where three years received less than 7.5 inches and three more than 20.3 inches. Drought usually hits all or most of the state at the same

time, as do unusually wet spells. The year 1956 was the driest in the 1951-80 period for 11 of the 17 stations in the table, the second driest for 2 more, and well below average for the remaining 4. The year 1972 was wet for all 17 stations. On the other hand, some areas can be wet while others are dry. At Raton, 1955 was the wettest year, but it was the driest at Santa Rosa and the second driest at Bloomfield and Chama. Drought years often occur in swarms, as happened in most parts of New Mexico from 1951 to 1956 when the 17 stations had a combined total of 89 below-average years and only 13 above average. Sometimes two unusual years at opposite ends of the scale follow one after the other. With 8.7 inches, 1956 was the driest at Charma while 1957, with 31.4 inches, was the wettest. It seems impossible to predict whether a year will be wet or dry.

Iven Bennett



The geologic history of New Mexico is wonderfully diverse. Exposed within the state's boundaries are Precambrian igneous and metamorphic rocks more than 1.5 billion years (b.y.) old, sedimentary strata representing each geologic period from Cambrian to Quaternary, and a variety of volcanic rocks erupted over the past 60 million years (m.y.) to within a few hundred years of the present. Study of these rocks and their relationships within the structural, tectonic, and geomorphic framework of New Mexico's present landscapes has yielded much information on the geologic evolution of the state. Because of the complexities of New Mexico's geology, however, only a brief outline of especially important aspects of the state's geology can be presented here. Some additional details of New Mexico stratigraphy and structure may be found in the discussion of the state's paleontology and young faulting elsewhere in this volume.

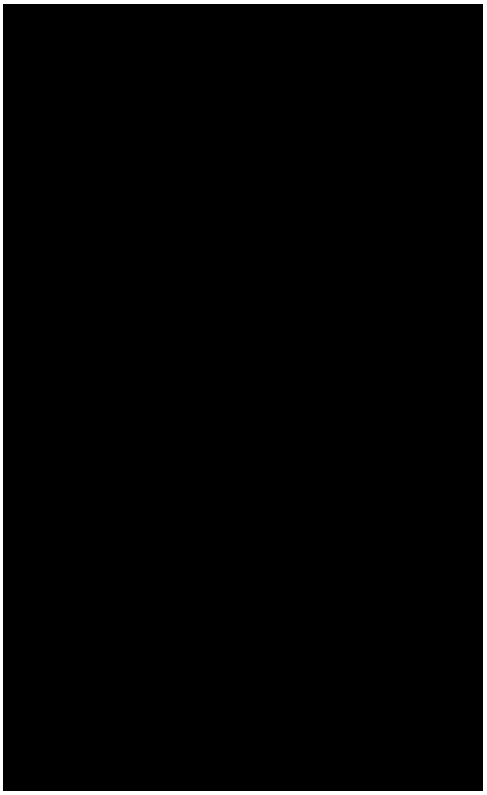
New Mexico's Precambrian rocks are exposed predominantly in the cores of mountain ranges along the east side of the Rio Grande and in a few Isolated ranges to the west, such as the Brazos, Nacimiento, Zuni, and Barros mountains. A wide variety of metamorphic and igneous rock types is present, with much local variation and many complex structures. In general the pattern seems to have been initial deposition and gradual burial of clastic sediments about 2 b.y. ago (probably at the edge of an ancient continent), accompanied by several episodes of extrusive volcanic activity, and followed by extensive regional folding, faulting, and metamorphism. Deformation and metamorphism wrought dramatic changes in the volcanic and sedimentary rocks: clastic sediments became contorted phyliltes, schists, and quartzites, and the extrusive volcanics were transformed into sheared belts of felsites and amphibolites. Intrusion of granitic magmas overlapped the long-continuing tectonism and metamorphism, producing metamorphosed gneisses, in addition to large volumes of undeformed granite. Pegmatite dikes, representing final crystallization of magmas and containing beryl, lepidolite, tantalite, and other rare minerals, were injected locally into older granites, most notably at the Harding pegmatite mine near Dixon, and in the Petaca District of the Brazos Mountains.

These events appear to have begun earlier in northern New Mexico. Precambrian rocks in the Brazos, Taos, and Nacimiento mountains have been dated at 1.7 to 1.8 b.y., whereas the Precambrian cores of the Zuni, Manzano, Ladron, and Magdalena mountains are 1.3 to 1.6 b.y. old, and the Sandia Granite is about 1.45 b.y. old. Farther south, in the San Andres Mountains, Precambrian ages are 1.3 to 1.4 b.y., and the Precambrian of the Franklin Mountains near El Paso is scarcely 1 b.y. old. As Precambrian metamorphic and igneous activity subsided, the landscapes began to be eroded, and, with the waxing and waning of Paleozoic seas across New Mexico, were in most areas eventually covered by Palsozoic sediments. Uplift during late Tertiary time, associated primarily with tectonic movement along the Rio Grande rift, has once again exposed some of these Precambrian rocks.

Through the Paleozoic Era most of the state was covered by vast shallow seas in which thick sequences of limestones, sandstones, and shales accumulated. The sedimentary record for the Cambrian through Devonian periods is limited to the mountain ranges in the south-central and southwestern part of New Mexico; erosion of early and middle Paleozoic sediments in northern New Mexico occurred later in the Paleozoic. Through the Mississippian and Pennsylvanian periods, marine sediments were deposited in many parts of New Mexico. Renewed uplift in the Pennsylvanian created several large north-south trending islands that divided the northern seas, and by the beginning of the Permian these islands had coalesced into a landmass that shed great volumes of red clastic sediments, pushing the shoreline inexorably southward. These events corresponded temporally to the worldwide assembly of supercontinent Pangaea. In southern New Mexico the tropical seas in which the great Capitan Reef Complex grew persisted until nearly the end of the Permian, but eventually dwindled and vanished, leaving thick sequences of salt and potash over much of southeastern New Mexico.

Rocks of Triassic and Jurassic age are confined mainly to the northern half of the state and were deposited as rivers spread eroded sediments across vast continental plains toward oceans to the west. Colorful red, green, gray, brown, and white sandstones and shales of the Chinle and Morrison formations represent these periods in many parts of northern New Mexico.

By the last half of the Cretaceous period the seas had returned; New Mexico was on the western shoreline of a great shallow ocean that covered most of central North America. Numerous advances and retreats of the shoreline produced a great variety of marine and swampy facies. The classic sequence in the San Juan Basin is the best and most easily observed example, for these Cretaceous units are widely exposed today over much of the northwestern quarter of the state. Most of New Mexico's coal deposits formed from the lush vegetation that existed in northwestern and northeastern New Mexico during this time. The sea retreated quickly out of the state at the close of the Cretaceous, the last time New Mexico would be covered by marine waters. About the same time, the Laramide orogeny, a profound mountain-building episode centered to the west of the state, intensified volcanic activity and uplift in the San Juan Mountains of southwestern Colorado and neighboring areas. Large volumes of clastic sediments were deposited by rivers across much of New Mexico, concentrating in structural depressions such as the San Juan and Raton basins. Local and sporadic volcanic and igneous activity also characterized some parts of New Mexico during the early Tertiary; the internal parts of these volcanic systems are now exposed as stocks and dikes mainly in southwestern New Mexico.



Beginning about 40 m.y. ago, much of southwestern and central New Mexico was subjected to an enormous explosion of volcanic activity that lasted about 20 m.y. before subsiding. Great thicknesses of ash-flow tuffs, along with andesite, rhyolite, and basalt flows, originated from gigantic volcanic cauldrons (some more than 50 km in diameter) as a consequence of complex interactions between two colliding lithospheric plates along the western coast of North America. Many of the cauldrons are not obvious in the present landscape, having been obscured by subsequent geologic events, but they form the cores of some of the most conspicuous topographic features of southwestern New Mexico, such as the Mogollon-Datil plateau, Black Range, and Organ, Magdalena, San Mateo, and Peloncillo mountains. Hydrothermal fluids associated with this volcanism produced some of New Mexico's most important metallic resources. Other large volcanic masses in central New Mexico (e.g., Sierra Blanca and the Capitan and Ortiz mountains) formed about this time, which also witnessed the final uplift of the Sangre de Cristo

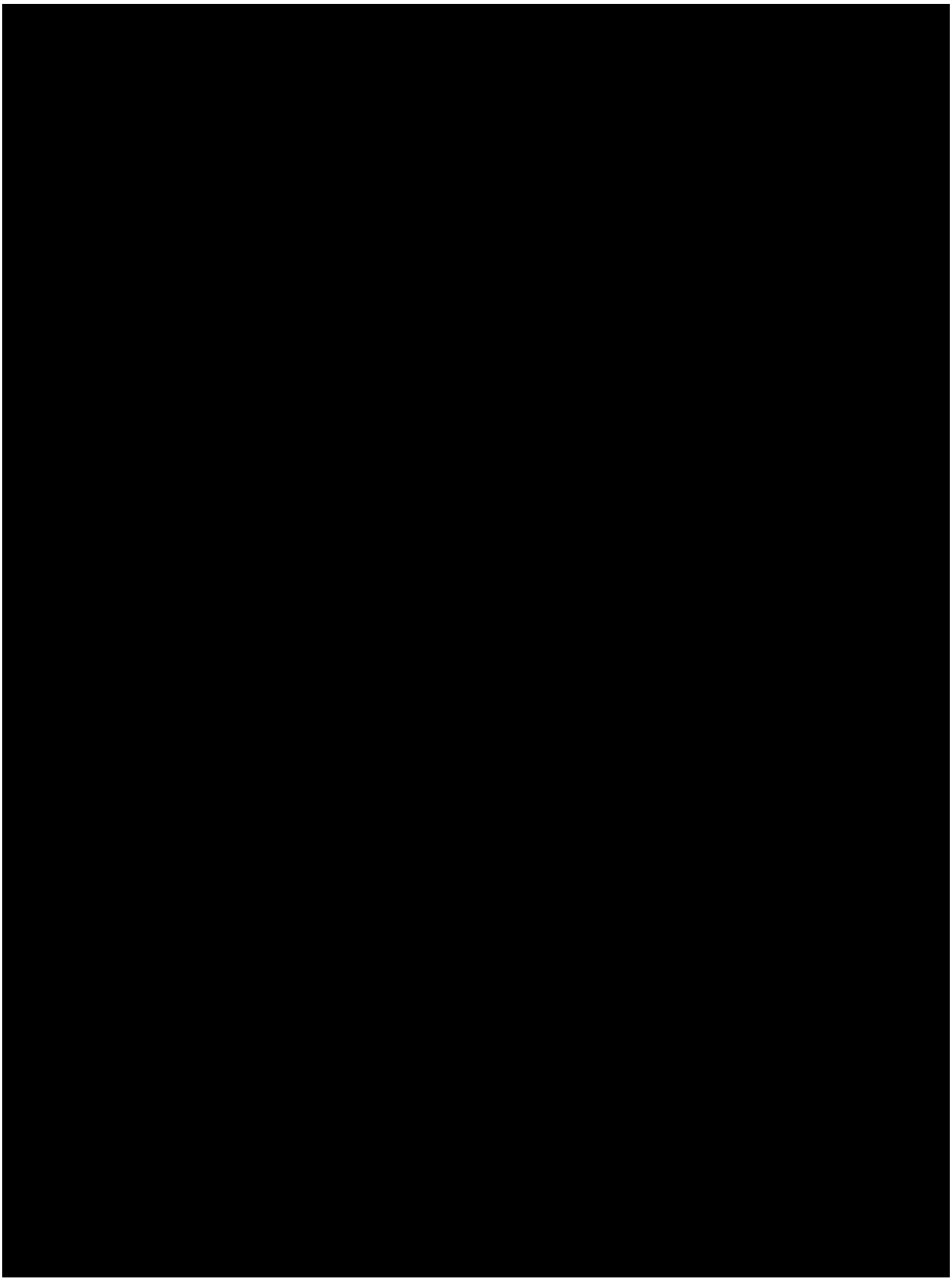
Mountains. Locally, the eroded necks of isolated volcanos which formed in the middle Tertiar)& such as Shiprock, still project above the modern landscape.

Continued crustal instability, chiefly extension, was also responsible for initiating, about 30 m.y. ago, the Rio Grande rift, a great north-trending structural depression that bisects the state. Along the eastern edge of the rift, fault blocks have been uplifted gradually to form a line of prominent mountain ranges, and the basins within the rift have accumulated thousands of meters of Miocene to Recent sediments. Continued evolution of the rift has also assured a strong igneous imprint on the geologic history of western and central New Mexico. In the Jemez Mountains, volcanism began about 10 m.y. ago, producing a series of basaltic and rhyolitic flows. As the magma chamber underlying the area became depleted, explosive eruptions beginning about 1.4 m.y. ago spread ashflow tuft and pumice across the Bandelier area, and scattered ash as far east as Kansas. Collapse subsequent to these eruptions created the Valles Caldera, with a diameter of 22 km, one of the largest in the world. After caldera collapse, magma continued to be extruded until a few tens of thousands of years ago. Extensive volcanism also began in northeastern New Mexico about 8 m.y. ago and left more than 100 cones as well as widespread lava flows covering more than a quarter of Union and Colfax counties. Volcanic activity continued here until about 4,500 years ago, and some of the youngest volcanos, such as Capulin, are virtually intact.

In west-central New Mexico the Mt. Taylor volcanic field flourished from about 3.5 to 2 m.y. ago; Mt. Taylor itself was built up over more than a million years of intermittent activity. The larger Zuni-Bandera field southwest of Grants is an enormous area of malpais and volcanic cones that originated about 1.5 m.y. ago and lava extrusion has continued nearly to the present. The McCarty's flow is one of the most voluminous volcanic flows in the world that has occurred in historical it times; its eruption about A.D. 1300 has been recorded in Indian stories. The extensive malpais near Carrizozo is not much older (perhaps 1,000-1,500 years old). Within about the past million years significant volcanic activity has also occurred southwest of Las Cruces and in several places along the west side of the Rio Grande in the Albuquerque area. The Albuquerque volcanos and related structures are between 150 and 200 thousand years old.

During the late Tertiary and Quaternary periods, sediments continued to be deposited in all parts of the state. The surface of the High Plains of eastern New Mexico is of this age, and thick Pleistocene sedimentary deposits have build up along the Rio Grande and many other rivers within the state. Erosion and deposition proceed rapidly compared to most other geologic processes, and many of the most conspicuous features of the present landscape-from the familiar desert mesas and buttes to the intricately dissected badlands of northwest and central New Mexico to the windblown gypsum dunes of White Sands-are all the result of very recent geologic processes.

Barry S. Kues and
Jonathan F. Callende



Physiographic Provinces I

A physiographic province is a region with a particular pattern of landforms that differs significantly from that of adjacent regions. Each province has a distinctive geologic framework and particular combinations of topographic and hydrographic features that have evolved through geologic time. The individual landforms (e.g., mountains, canyons, alluvial tans) that in aggregate make up the varied natural landscapes of a given province reflect a variety of geomorphic processes. In New Mexico these range from the action of deep-seated (hypogene) forces, including volcanism and tectonism, to surficial (epigene) processes, such as erosion and sedimentation by water or wind.

The Southern Rocky Mountain Province extends from Colorado into the north-central part of the state as a two-prong system of high ranges separated by deep structural basins of the northern Rio Grande rift. The eastern prong of the Southern Rockies includes several ranges of the Sangre do Cristo Mountains between the San Luis and Española rift basins and the Raton Section of the Great Plains. The area east of Taos also includes the high, parklike Moreno Valley between the central Sangre de Cristos and the Cimarron Mountains. The western mountain prong between the Navajo Section of the Colorado Plateau and the Rio Grande rift basin includes the Brazos uplift to the north and the outlying San Pedro, Nacimiento, and Jemez mountains to the south. The latter highland areas, located south of the lower Chama Valley, are transitional to the southeastern Colorado Plateau and Basin and Range provinces.

The Sangre de Cristo, Brazos, and San Pedro-Nacimiento ranges have cores of Precambrian crystalline rocks overlain by Paleozoic, Mesozoic, and lower Cenozoic sedimentary rocks. Cenozoic volcanic and sedimentary rocks cap the ranges in a number of areas. Numerous glaciated peaks and alpine valleys are present in the Sangre de Cristos north of Santa Fe and in the Brazos uplift near the Colorado border. Among these peaks is Wheeler Peak (13,161 ft), the high point of the state, northeast of Taos. Valleys draining areas of alpine glaciation (e.g., Chama, Costilla, Red, Embudo-Santa Barbara, Narnbe, Santa Fe, Pecos, Mora) have stepped sequences of glacial-outwash terraces.

The Jemez Mountains west of Los Alamos (maximum elevation 11,561 ft) are primarily a constructional feature built by late Cenozoic volcanism. Eruptions of Pleistocene age produced the huge Toledo-Valles caldera complex as well as the Bandelier Tuff that caps the Pajarito Plateau at the western edge of the Española structural basin.

The Southern Rocky Mountain Province also includes the San Luis Valley, a Rio Grande rift basin that is transitional southward to the Española Valley in the Basin and Range Province. At the southern end of the basin, the Rio Grande has cut a deep gorge (canyon walls up to 1,000 ft high) in the thick accumulation of Pliocene basalt flows that forms the central Taos Plateau. The eastern part of the plateau includes a constructional plain built by alluvial fans at the bass of the Sangre de Cristos.

The Colorado Plateau Province in northwestern New Mexico is part of a larger region (extending into Arizona, Utah, and Colorado) characterized by erosional landscapes carved on relatively undeformed sequences of sedimentary and volcanic rocks. The Zuni Mountains between Gallup and Grants are the only major mountain uplift. The summit of the Mount Taylor volcanic center (elevation 11,301 ft) is the highest point in the New Mexico part of the province. Major landforms include scarp-bounded tablelands (plateaus, mesas, buttes, and benches), cuestas, hogbacks, and a variety of valley and canyon types. The province straddles the continental divide (6,675 to 9,916 ft elevation range) and contains headwaters of the Rio Chama and Rio Puerco (Rio Grande system) on the east, and the San Juan and Little Colorado rivers on the west.

The Navajo Section of the Colorado Plateau is dominated by two structural basins with thick sequences of gently dipping Mesozoic and lower Cenozoic sedimentary rocks, mainly shale, mudstone, and sandstone with extensive coal seams. The large San Juan Basin lies between the Southern Rockies, the Four Corners platform, and the Zuni-Defiance uplift. The smaller Gallup-Zuni basin is located south and west of the Zuni Mountains. The Chuska Mountains (maximum elevation 9,370 ft), along the New Mexico - Arizona border, are a tableland with prominent bounding escarpments. Prominent volcanic

necks, such as Shiprock, in the Four Corners area north of the Chuskas result from exhumation of feeder conduits at middle Cenozoic volcanic centers.

Aside from narrow hogback belts eroded on steeply dipping strata of monoclines flanking major structural upwarps, the Navajo Section is characterized by broad rolling plains carved on easily eroded rocks, and cuestas and tablelands capped by gently dipping resistant sandstone beds. Canyonlands and escarpments of moderate local relief occur mainly in the eastern part of the San Juan Basin. However, most stream valleys are broad, with relatively short canyon reaches; areas of high cliffs and escarpments are of limited extent.

The highest point in the New Mexico part of the Navajo Section is at Chromic, Mountain (elevation 9,916 ft) on the Continental Divide near Chama. The lowest point is the San Juan River channel near the Four Corners at the boundary between the Navajo and Canyonlands sections of the Colorado Plateau (elevation about 4,700 ft).

The only major perennial streams in the Navajo Section are the San Juan River, the Animas and La Plata rivers (which join the San Juan near Farmington), and the upper Rio Chama. The floodplains of these rivers are flanked by stepped sequences of fluvial terraces of Pleistocene age.

In the eastern part of the San Juan Basin, badlands are locally well developed on steep slopes carved on shaly sequences of late Cretaceous and early Cenozoic age. Partly vegetated aeolian sand sheets, with low east-northeast-trending dune ridges, and small active dune fields form extensive caps on upland surfaces in the central part of the Navajo Section, particularly between the ,an Juan and Chaco Valleys.

The Acoma-Zuni Section, the southeastern subdivision of the Colorado Plateau, is a newly defined physiographic unit that includes the northern part of the area previously designated the Datil Section. The unit is bounded on the east by the Albuquerque Basin, a Rio Grande rift basin in the northern part of the Basin -and Range Province. The Datil-Mogoilon (transitional) Section lies to the south.

The Acoma-Zuni Section is characterized by extensive upper Cenozoic volcanics that form a discontinuous cover on erosional and constructional landforms typical of the neighboring Navajo Section. The northeastern Acoma-Zuni area is dominated by Mount Taylor, a composite stratovolcano of Pilocene age, and nearby basalt-capped mesas. Cabezon Peak at the northeast edge of the section is a particularly prominent plug-type volcanic neck. To the west. the elongate upwarp of the Zuni Mountains (maximum elevation 9,265 ft), with a core of Precambrian crystalline rocks, is flanked by hogback and cuesta belts that have dipslopes and scarps capped by Permian and Triassic limestone and sandstone.

Broad plains south and east of the Zuni uplift are covered with Quaternary basalt flows and dotted with numerous cinder and lava cones. The Malpais Lava Field south of Grants contains the McCarty's basalt flow, which is about 1,000 years old and is the youngest volcanic unit in the state.

The Acoma structural sag and adjacent Lucero Uplift in the southeast part of the section include prominent sandstone-capped mesas and buttes of the Acoma and Laguna reservations. Limestone- and sandstone-capped cuestas and benches of the Sierra Lucero area overlook the lower Rio Puerco, Valley in the western Albuquerque Basin. As in the northern part of the section, many tablelands are capped with Pliocene basalt flows.

Much of the Acoma-Zuni Section is drained by the Rio San Jose, the major tributary to the Rio Puerco. Downstream from its headwaters in the Zuni Mountains and Malpais Lava Field the river has few perennial reaches. Most narrow, deeply entrenched valleys of the San Jose system are south and east of the Mount Taylor volcanic field; elsewhere major valleys of the San Jose system are commonly broad, but still well entrenched below upland areas. Pleistocene basalt flows cap river terraces in the lower San Jose Valley downstream from Laguna.

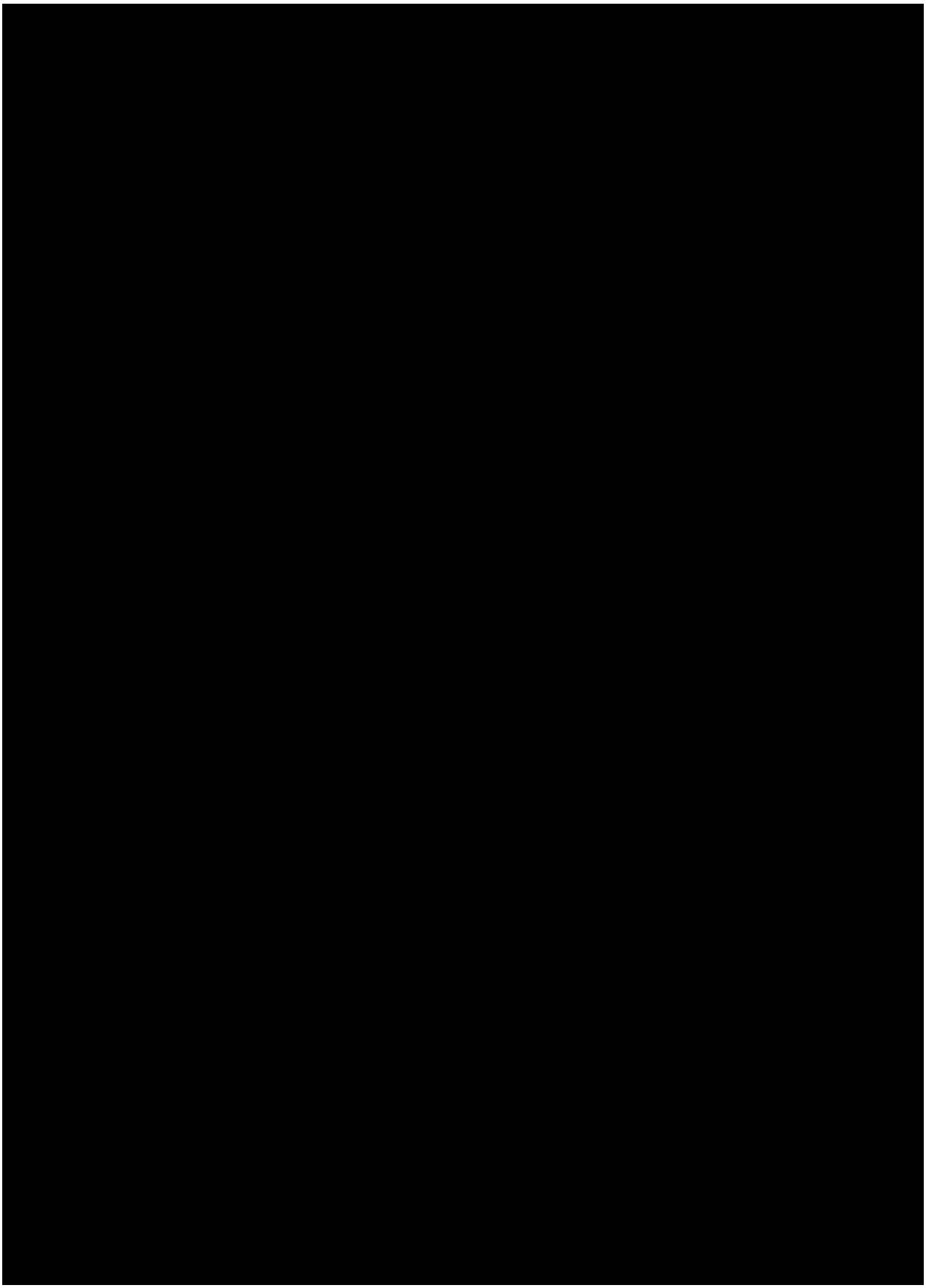
The Datil-Mogollon Section is part of a physiographic subdivision that is transitional between the Basin and Range Province and the Colorado Plateau. It is also a newly defined unit that includes the southern part of the area previously designated the Datil Section. This region of volcanic highlands extends into east-central Arizona and contains several large structural basins and block-faulted ranges. It is bounded on the east by basins of the Rio Grande rift, which are part of the Mexican Highland Section of the Basin and Range Province.

The Datil-Mogollon volcanic field is the dominant geologic feature in this section and lavas and tuffs are the main rock types. Major landscape units are erosional remnants of huge cauldron structures with volcano-tectonic depressions and resurgent domes. There are also remnants of large stratovolcanoes, mainly composed of basaltic andesite. High tablelands are capped with tuft, andesite, and basalt lavas, and volcanic-derived conglomeratic sandstones and mudstones.

The Datil-Mogolion Section also straddles the Continental Divide (6,650 to 10,000 ft elevation range). The area west of the divide is drained by perennial headwaters of the upper Gila system, including the San Francisco and Tularosa rivers. Canyon incision by these streams has resulted in the deeply dissected tableland topography of the upper Gila River basin.

Internally drained structural basins (bolsons) and valleys of major ephemeral streams (arroyos) draining to the Rio Grande are dominant features east of the Continental Divide. San Augustin Plains, the floor of the largest closed basin (minimum elevation 6,780 ft), was the site of pluvial Lake San Augustin. Maximum elevation of shoreline features is slightly higher than 7,000 ft.

John W Hawley



Soils

Factors of Soil Formation

According to the *Soils of New Mexico* report (1978), the kind of soil that develops in any area is the result of the interaction of five soil-forming factors: climate, vegetation, parent material, topography, and time. The first two are called "active" factors because they act -on the soil parent material as conditioned by topography over varying periods of me.

Climate and vegetation frequently are considered together because climate is the major determinant of vegetation. Soils of the high mountains of northern New Mexico are commonly leached, well developed, and acidic because precipitation is relatively high, temperatures are low, and the dominant vegetation is coniferous trees, which are best suited to the climatic and soil conditions. On the other hand, grasses and desert shrubs are dominant in the hot, dry desertic region. Here, the soils are not leached, are less developed, and neutral or alkaline. Whether soil determines the kind of vegetation or whether vegetation determines the kind of-soil is a much-debated point, but climate certainly is the deciding factor for both.

In New Mexico, temperature and precipitation are related principally to land elevation. For example, in the relatively short distance between the Tularosa Basin and the ski run on Sierra Blanca, temperatures drop, precipitation increases, the vegetation changes from grasses to trees, and the soils change from calcareous and weakly developed to acidic and strongly developed. The growing (frost-free) season varies from about 210 days at the lowest part of the state near Carlsbad to fewer than 100 days in the Sangre de Cristo Mountains of northern New Mexico. Desert grasses and shrubs are the dominant vegetation in the arid plains of the south, whereas alpine vegetation occurs above the timberline on high mountain peaks. Precipitation distribution patterns differ from eastern New Mexico to western New Mexico. In the east, precipitation is lowest in winter and highest in summer. In the west, precipitation is at a minimum in April and May and a maximum in July and August.

Parent material consists of the geologic material from which soils are developed. Soils on very young alluvium, such as in the valley of the Rio Grande or on the sand dunes of southern New Mexico, are essentially undeveloped, so their characteristics are similar to those of the parent materials. On the other hand, soils of the high mountains of northern New Mexico have characteristics that bear little relation to the parent material from which they developed. Climate and vegetation are the dominant soil-forming factors in humid areas.

Rocks of Cretaceous, Tertiary, and Quaternary ages dominate the surficial geology, but geologic formations dating as far back as Precambrian occur, mostly in the north-central part of the state. Evidence of volcanic activity can be seen throughout the state except in the southeastern quarter, where only sedimentary formations are found. Lava flows occurred as recently as about 1,000 years ago south of Grants. Limestone and sandstone are the principal sedimentary rocks for the state as a whole, but shale is locally important north and west of Tucumcari and in the northwest comer of the state.

Topography affects soils greatly. Thin, eroded soils are commonplace on steep slopes. In depressions, fine-textured, saline, poorly drained soils are a logical consequence of the topographical conditions. Soils on the south-facing slopes are subject to higher temperatures than their counterparts on the north sides of hills. The topography of the state is highly varied. The high plains of eastern New Mexico are relatively flat. The remainder of the state includes basins, plains, plateaus, mesas, mountains with their valleys, and floodplains.

The importance of time to soil formation arises from the fact that natural processes of soil development tend to reach an equilibrium which depends upon local environmental conditions. It takes thousands of years for a mature soil to develop from raw rock materials. The landscape of New Mexico is young, geologically speaking. Nearly all surficial deposits from which soils have developed have been affected by climatic changes occurring in the last million years. Many of them owe their characteristics to the soil-forming processes operating during and since the last glacial period.

Soil Classification

Soil scientists use several systems to classify soils. These deal with the soil as a natural body and consider the volume of soil affected by biological activity, which usually extends to a depth of several feet. One such classification lists the five soil orders in New Mexico as Aridisols, Mollisols, Entisols, Inceptisols, and Alfisols. Aridisols are extensive in lower elevations over the southern two-thirds of the state but are replaced in the cooler and moister higher elevations by Mollisols. Entisols occupy the Rio Grande Valley from Santa Fe south to the Texas-Mexico border. The northern third of the state and the far eastern counties are dominated by Mollisols, Entilsols, and Alfisols. Inceptisols are found in the highest elevations of the San Juan and Sangre de Cristo Mountains. Other materials of note include the gypsum sands of White Sands National Monument and the lavas of the Carrizozo, Grants, and other malpais (lava rockland).

Aridisols dominate the lower elevations of New Mexico. Aridisols lack necessary moisture for mesophytic plant growth for long periods. Thus, Aridisols are not suitable for dryland agriculture. During most of the year the soil water is held at tensions above the wilting point for most plants. Generally, the soil horizons (distinct layers of soil) were formed under a more moist regime, as during former pluvial periods. The surface horizon (layer) is usually low in organic matter content and is thus light in color. The Aridisols are often calcareous from the surface downward and have a secondary accumulation of calcium carbonate (lime) and/or gypsum in the subsoil. Soil textures range from loamy sands to clays and consistency ranges from soft to extremely hard. Most of the surface is bare much of the time and in many instances a surface gravel pavement has formed by deflation of the finer windblown particles. The Aridisols are important resources but are easily misused. Both wind and water erosion are a constant hazard. Under agriculture, special fertility problems can exist because of unavailable micronutrients resulting from a high pH. In general, however, the Aridisols have a high content of bases needed for plant growth.

Entisols can occur in any climate; however, most of these soils in New Mexico occur in an arid climate in association with Aridisols. Entisols have been exposed to the soil-forming processes for such a short time that no major soil horizons have formed. Examples of Entisols are soils on floodplains or soils frequently moved by w1ind erosion. They also occur on moderate to steep slopes where bedrock is shallow. In general, the Entisols express the properties of the parent material with little change. Their nutrient-supplying capacity is generally high. Salinity and sodicity may be limited. Erosion hazard can be high, especially on the soils derived from wind-blown sediments. Most of the soils of the Rio Grande Valley in agriculture are Entisols.

Inceptisols exhibit the initial sign of soil development: a color change in the subsoil. They occur in areas of more rainfall than those yielding Aridisols. In New Mexico this is mainly in mountains which receive more than 12-14 inches of rainfall. The Inceptisols are young, occurring mainly on steep slopes where erosion removes weathered sediments. They also occur in areas dominated by volcanic pumice where insufficient time has passed to allow the formation of a more weathered soil. In New Mexico, their base-supplying capacity is generally high.

Affisols also occur in climates more moist than those yielding Aridisols. Affisols occur in the mountains of northern New Mexico and on the plains in eastern New Mexico. Organic matter accumulation in the surface horizon is greater than in Aridisols but is still low enough that the color is either light or dark to only shallow depths. Affisols have been subjected to soil formation processes for long enough that clay has translocated and accumulated in the subsoil. Many of the Alfisols have sufficient moisture and nutrient supply to support dryland agriculture.

Mollisols are characterized by deep, dark surface horizons of high organic - matter content. They occur in areas of New Mexico with more than 12-14 inches of rainfall (similar in rainfall to areas with Inceptisols and Alfisols). - Mollisols are dominantly grassland soils but do occur in the forests of southern New Mexico where the base status is high and grass is the dominant understory. Mollisols are very fertile soils with a high supply of nutrients. Lime often accumulates in the subsoil. Mollisols, like

most soils in New Mexico, are fragile when misused. Water erosion hazard is high in some areas. Most of the Mollisols are used to support grazing; some in eastern New Mexico are used for crop production.

Harry J. Maker
Leroy A. Daugherty

Vegetation: Plateau, Basin, and Plains

The second grouping of New Mexican vegetational assemblages, extending over the desert, basins, and plains (and therefore the larger part) of the state, includes associations of the Chihuahuan Shrub, Chihuahuan Grassland, Great Basin Shrub, Great Basin Grassland, and Plains and Prairie Grassland.

Chihuahuan Shrub vegetation with creosote bush dominant is characteristic of desert regions of southern New Mexico and extends northward along the valley of the Rio Grande to Bernalillo County. In some areas creosote bush shares dominance with tarbush to form a dispersed overstory. On other sites tarbush is essentially absent and bush muhly becomes more prominent. Other grasses, including three-awn, fluffgrass, tobosa, and black grama, may be associated, and subshrubs such as yucca and snakeweed may occur in varying amounts. Among forbs, probably the most prominent species is desert marigold.

Chihuahuan shrub vegetation with acacia dominant association occurs mostly in southeastern and southwestern New Mexico and is usually characterized by catclaw acacia along with mesquite. Most of these sites are scattered and are often too small to be definitively mapped. Probably the largest continuous association of this kind occupies the area directly west and southwest of Carlsbad and extends into Mexico. Various grasses are also common here.

Chihuahuan shrub vegetation with four-wing saltbush dominant is usually associated with a scattering of mesquite, creosotebush, tarbush, coldenia, and iodinebush. Dominant grasses of the understory include either alkali sacaton or tobosa; these taxa are commonly associated with vine-mesquite, burrograss, saltgrass, sand dropseed, and gyp grama. This association is chiefly confined to desert areas of southern New Mexico, areas bordering the northern, eastern, and southern borders of White Sands, the Playas Lake area of Grant County, north-central Hidalgo County, and southeastern Socorro and southwestern Lincoln counties.

Great Basin Shrub vegetation with big sagebrush dominant association is characterized by a scattering of Colorado pinyon and juniper with the big sagebrush. In the open spaces, common grasses are sand dropseed, blue grama, alkali sacaton, galleta, and western wheatgrass. This association is located mostly between 6,000 and 6,500 ft in western Taos, southeastern Rio Arriba, and northeastern Sandoval counties.

Great Basin shrub vegetation with saltbush dominant is an assemblage where dominance is usually shared by several species of saltbush, including four-wing, shadscale, and Nuttall saltbushes. On open slopes and mesas, pinyon, juniper, antelope brush, and serviceberry may be scattered and in flats greasewood may be locally abundant. Principal grasses include Indian ricegrass, galleta, blue grama, sideoats grama, alkali sacaton, and three-awn. This association is characteristic of sites throughout much of San Juan County between 6,000 and 6,500 ft, in western Sandoval, northern and eastern McKinley, and northwestern Bernalillo counties, and also an area of central Catron County.

Chihuahuan Grassland vegetation with burrograss dominant is an open grassland dominated by burrograss, usually containing significant amounts of tobosa, and to various degrees scatterings of fluffgrass, gyp dropseed, and gyp grama. Occasionally the boraginaceous subshrub, coldenia, will occur. This association extends from central Chaves County to central Eddy County and occurs in south-central Eddy County but does not extend into Mexico.

Chihuahuan grassland vegetation with grama grass dominant is composed of several dominant grama grasses, including black, blue, hairy, or sometimes sideoats grama in association with three-awn or tobosa at some localities and curly mesquite or bush muhly at others. Sometimes sand dropseed or burrograss occur as well as a scattering of cacti, juniper, or creosote bush.

Chihuahuan grassland vegetation with black grama dominant is dominated by black grama in conjunction with several species of dropseed and an occasional yucca on some sites, but in conjunction with bush muhly and a scattering of creosote bush on other sites. Species of cacti also occur at many of these sites and, in sandy areas, sand sagebrush appears. This association is scattered throughout much of the Chihuahuan Desert region.

Chihuahuan grassland vegetation with dropseed and Indian ricegrass dominant is typically found on sandy sites and dominated by several species of dropseed, such as sand, mesa, and spike dropseed, in

conjunction with ricegrass. Scattered shrubs include yucca and sand sagebrush. This association is relatively uncommon, occupying several sites in the central Rio Grande Valley including parts of Bernalillo, Valencia, and Socorro counties.

Chihuahuan grassland vegetation is also with sacaton and tobosa dominant. Giant and alkali sacaton, along with tobosa, are the important representatives here. This association is found in a few localities in Sierra, Lincoln, and Otero counties.

Great Basin Grassland vegetation with Indian ricegrass and galleta dominant is associated with various other grasses, including blue grama, sand dropseed, various three-awns, and sometimes sideoats grama. There may be a scattering of big sagebrush, Mormon tea, snakeweed, and juniper on some sites. This association is scattered throughout the northwestern and west-central counties.

Great Basin grassland vegetation with big sagebrush dominant is found in conjunction with Indian ricegrass, sand dropseed, galieta, three-awn, blue grama, or sometimes western wheatgrass. Rabbitbrush may be locally abundant and populations of snakeweed occasionally occur. This association is mostly found in San Juan, Sandoval, and Taos counties.

Great Basin grassland vegetation also occurs with saltbush and alkali sacaton dominant. At least two species of saltbush are found here, usually four-wing and shadscale, along with alkaii sacaton and lesser amounts of other grasses such as blue grama and western wheatgrass. Populations of rabbitbrush may occur sporadically. This association is found throughout the Great Basin region.

There is a large area of Great Basin grassland vegetation with grama grasses and western wheatgrass dominant. Several species of grama grasses are common here and include sideoats, blue, black, and hairy grama in conjunction with western wheatgrass. Other grasses found in various but lesser amounts are muhly, vine-mesquite, or three-awns and sometimes small amounts of Indian ricegrass or junegrass appear. This association is most common in Valencia, Cibola, and Catron counties.

Plains Grassland vegetation with blue grama dominant is, depending on the site, mostly associated with western wheatgrass, buffalograss, galleta, black grama, or needlegrass. Other grasses, such as ring muhly, three-awn, galleta, sideoats grama, little bluestem, or sand dropseed, may also occur as well as shrubby taxa including snakeweed, winterfat, sumac, and various cacti and yuccas. Scattered junipers may also appear here but are not usually considered major components of the assemblage. This group of associations is situated in eastern New Mexico and constitutes a significant part of the Plains flora.

Plains grassland vegetation with sideoats grama dominant is another complex assemblage of associations with sideoats grama typically dominant and associated, depending upon the association, with blue grama, black grama, rurly mesquite, Metcalf muhly, and feathergrass. Less common grass species are galleta, sand dropseed, buffalograss, three-awn, plains bristlegrass, tridens, and western wheatgrass. Shrubby plants such as snakeweed, yucca, sotol, winterfat, cacti, and sometimes scrub oaks may occur in varying amounts. Also, junipers may be locally common. This assemblage is found throughout the Great Plains region of New Mexico.

There is a small area in the state of Plains grassland vegetation with buffalograss dominant. This taxon usually shares dominance with blue grama in this reasonably well-marked short-grass association, with the dominants interspersed with varying amounts of vine-mesquite, tobosa**,** galleta, and alkali sacaton. Mesquite sometimes also occurs in limited amounts, usually in localized populations. This association is most common in extreme eastern New Mexico, primarily in eastern Quay County.

Plains grassland vegetation with four-wing saltbush and sacaton dominant usually includes the dominants with varying numbers of other taxa interspersed. Sometimes alkali sacaton occurs in nearly pure stands. At other sites, four-wing saltbush is a strong primary dominant with minor grass components interspersed. This assemblage occurs mostly in relatively small areas of Catron, Socorro, Torrance, and Quay counties.

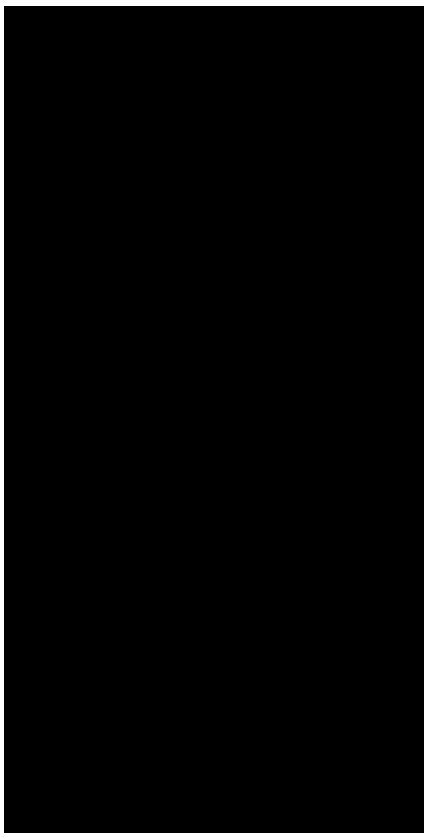
giant and sand dropseed, sideoats and black grama, bristlegrass, and yucca. On still other sites, sideoats grama will be a secondary dominant and associated species may include hairy grama and a scattering of juniper. This assemblage is found in several of the eastern counties, from De Baca County eastward beyond the border.

William C. Martin

National Cooperative Soil Survey

Western Regional Conference

June 14-19,1998



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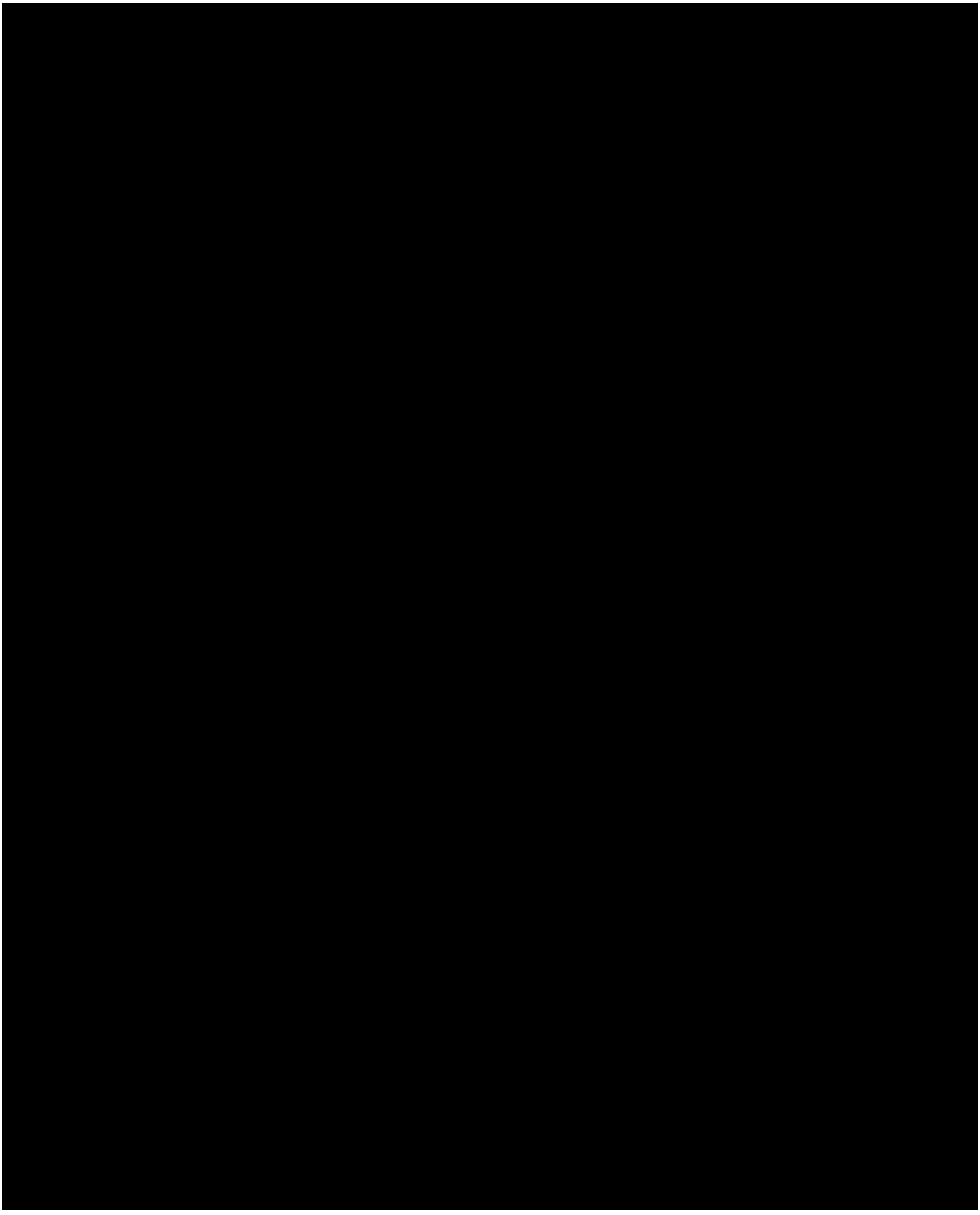
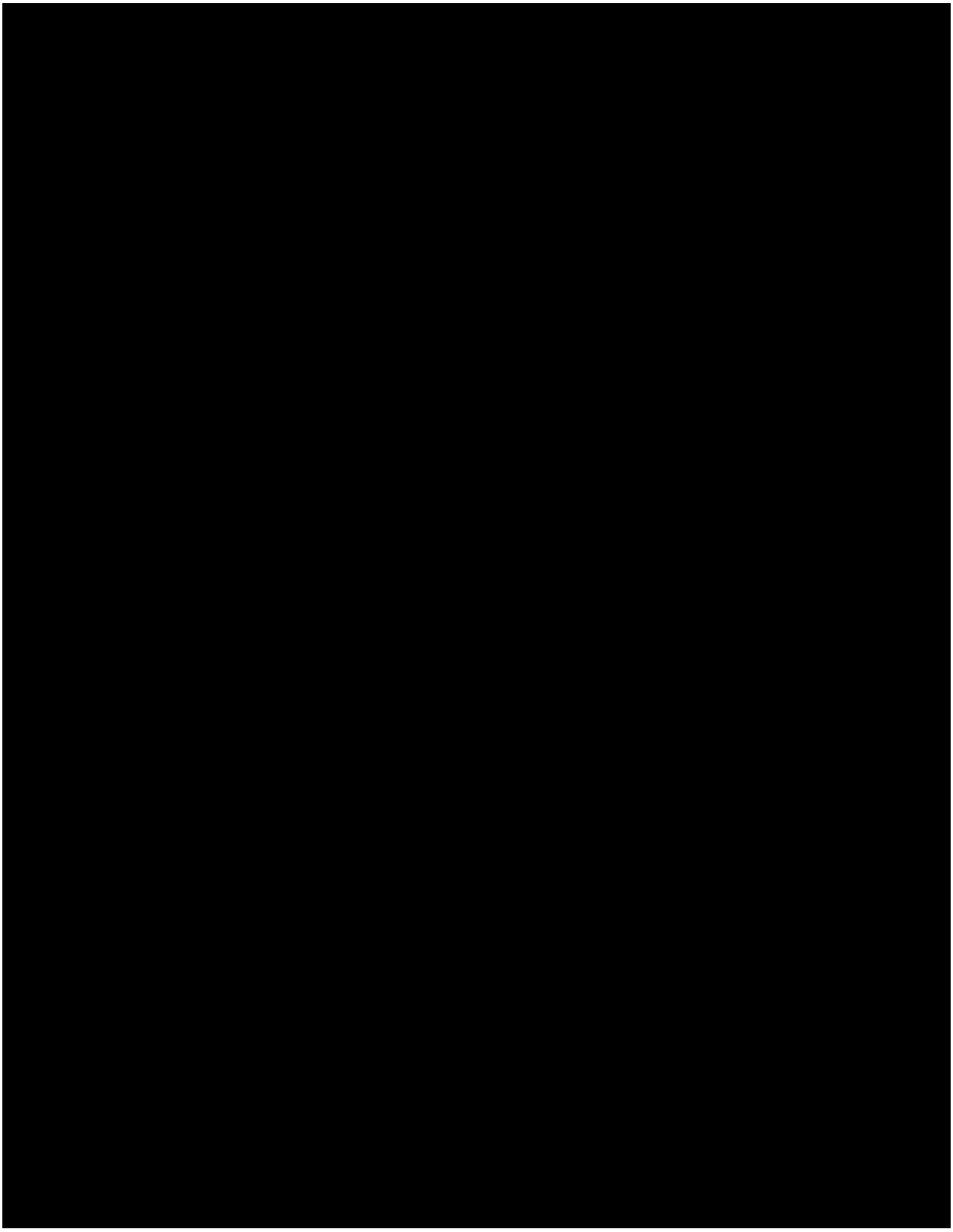
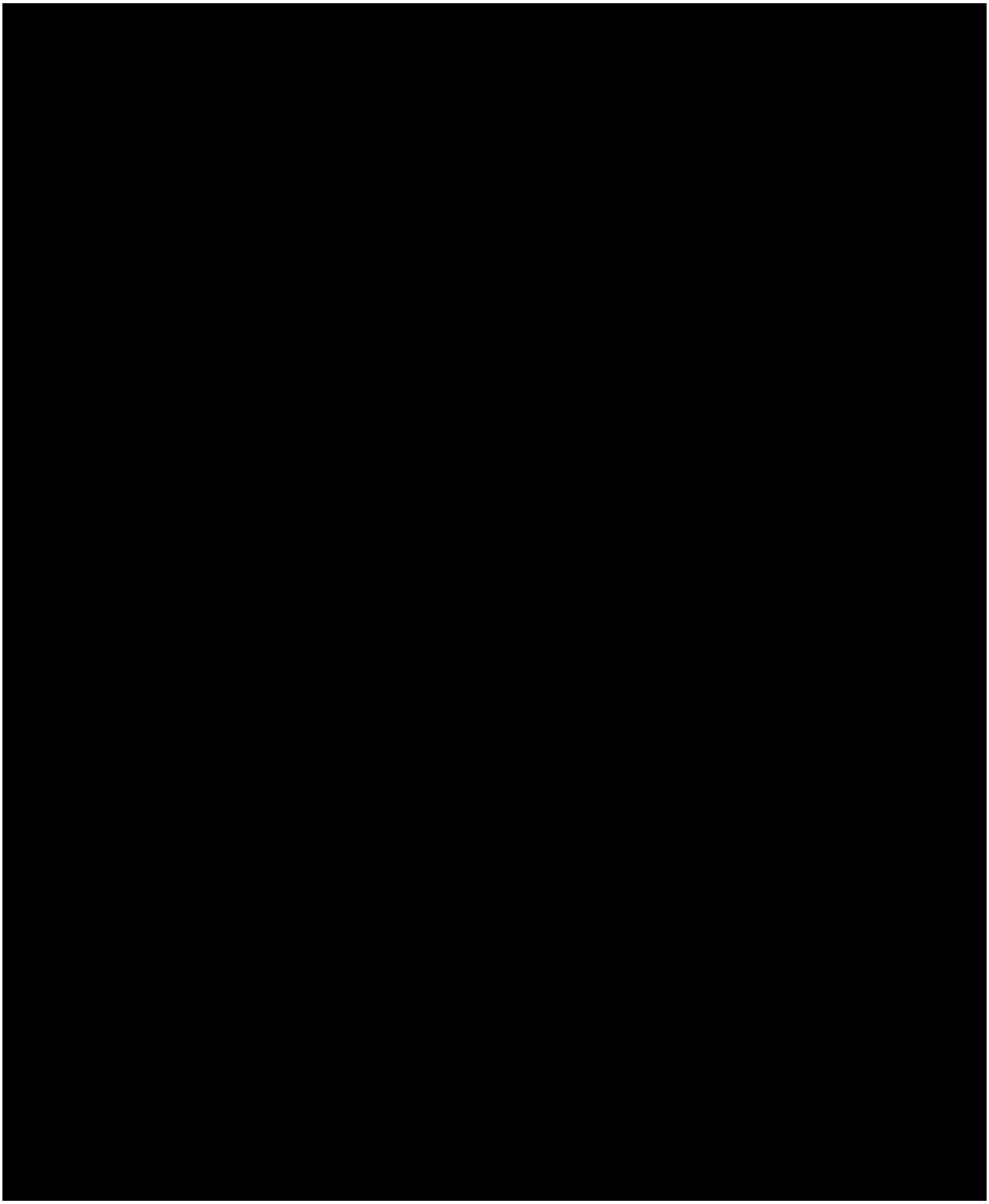
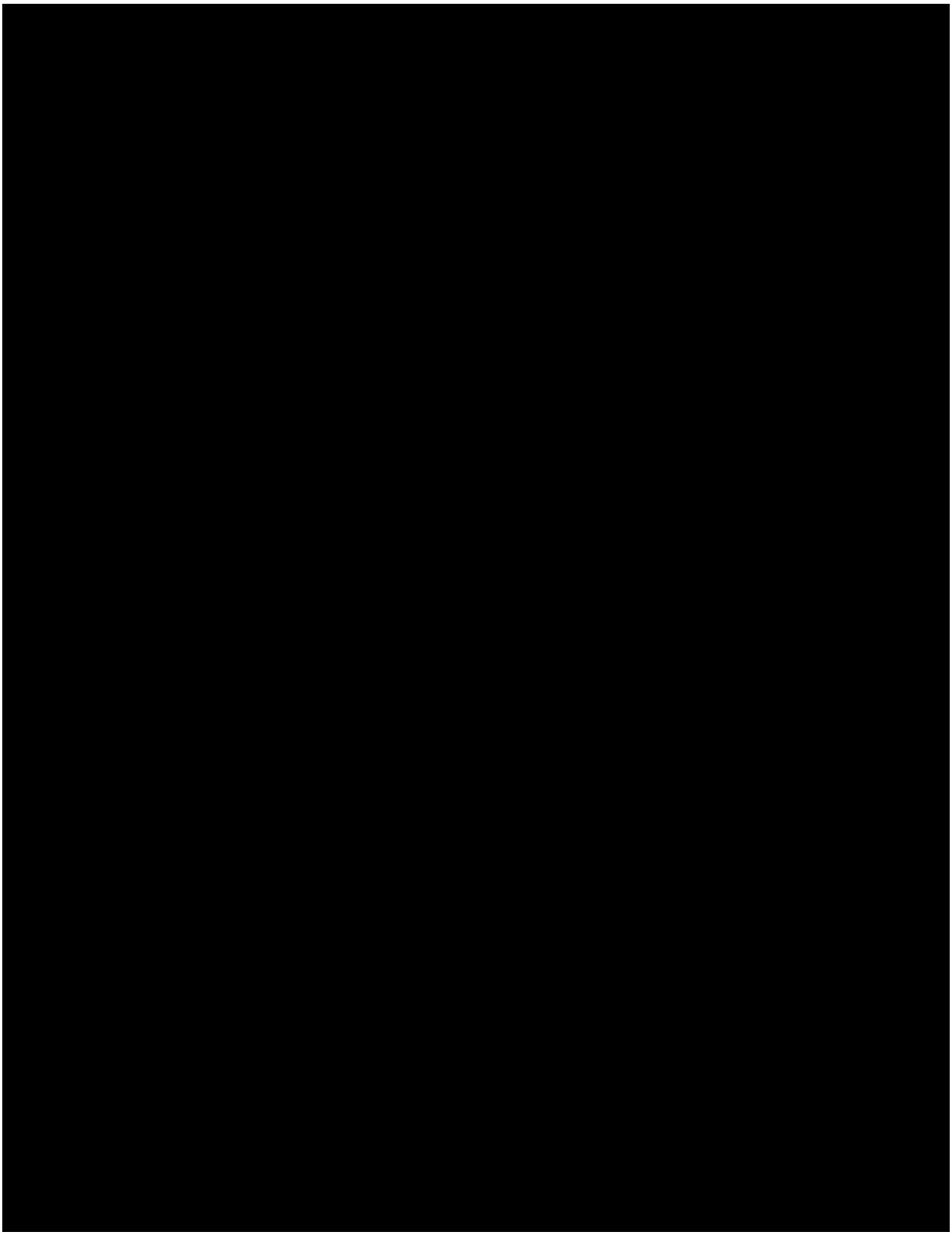
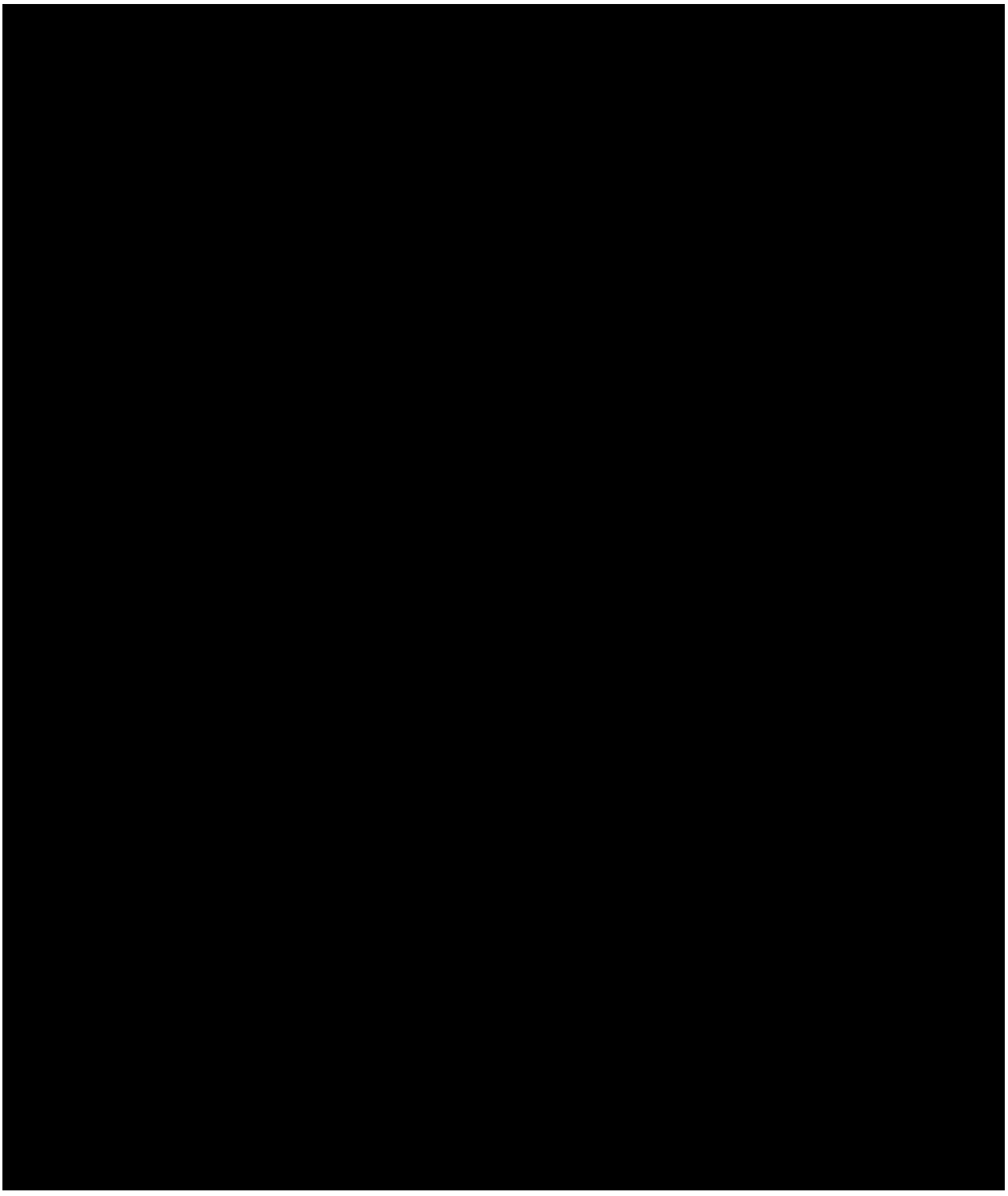
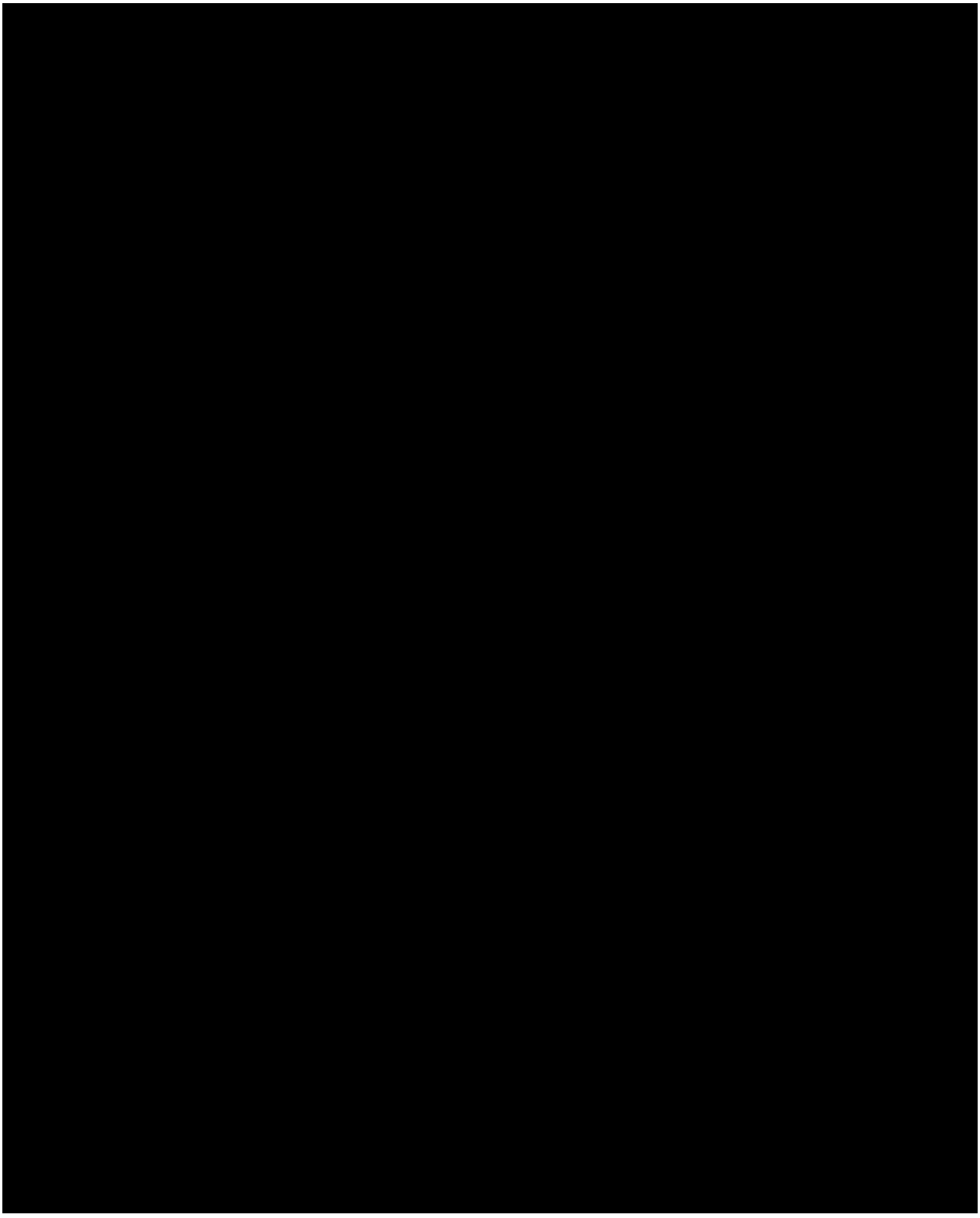


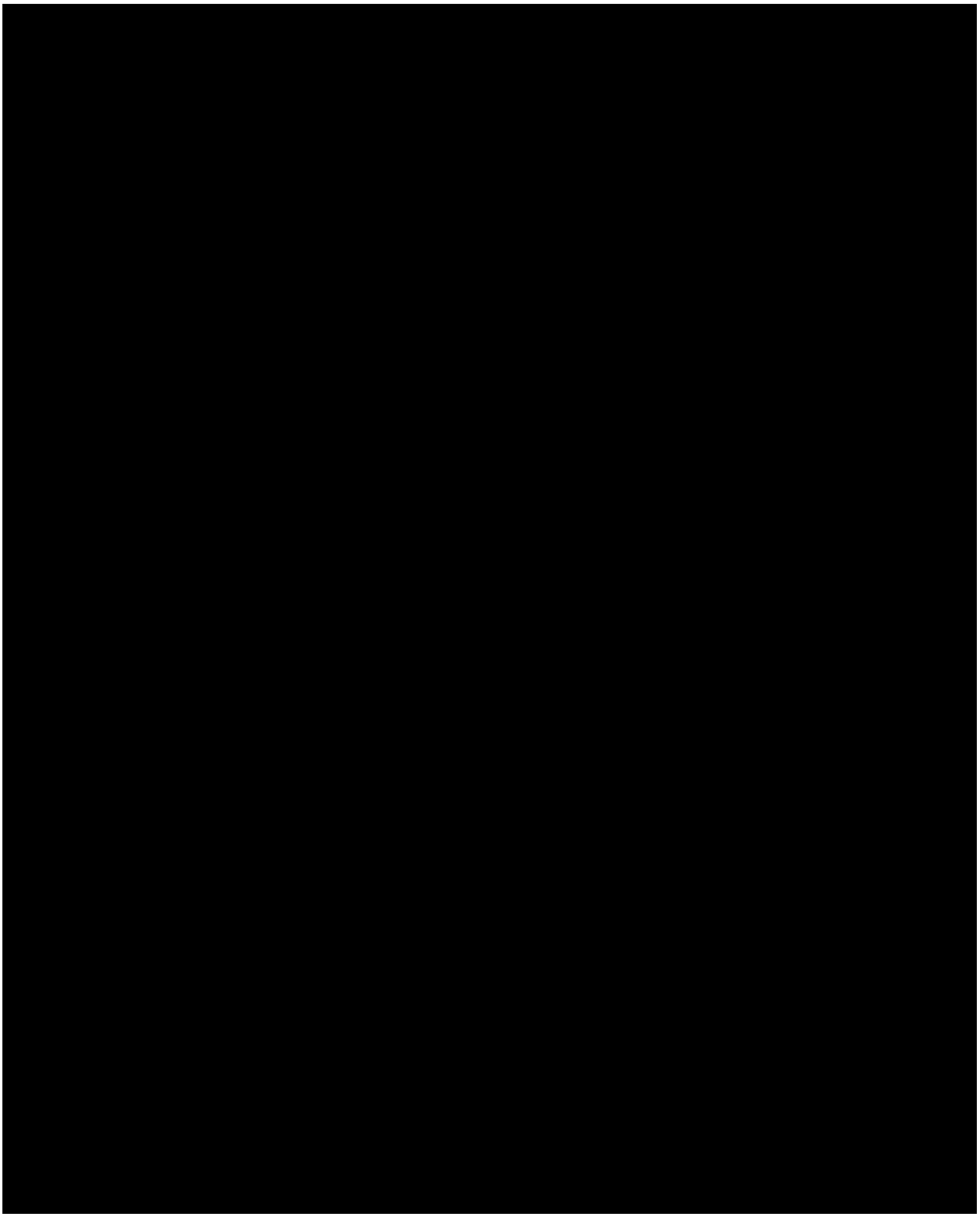


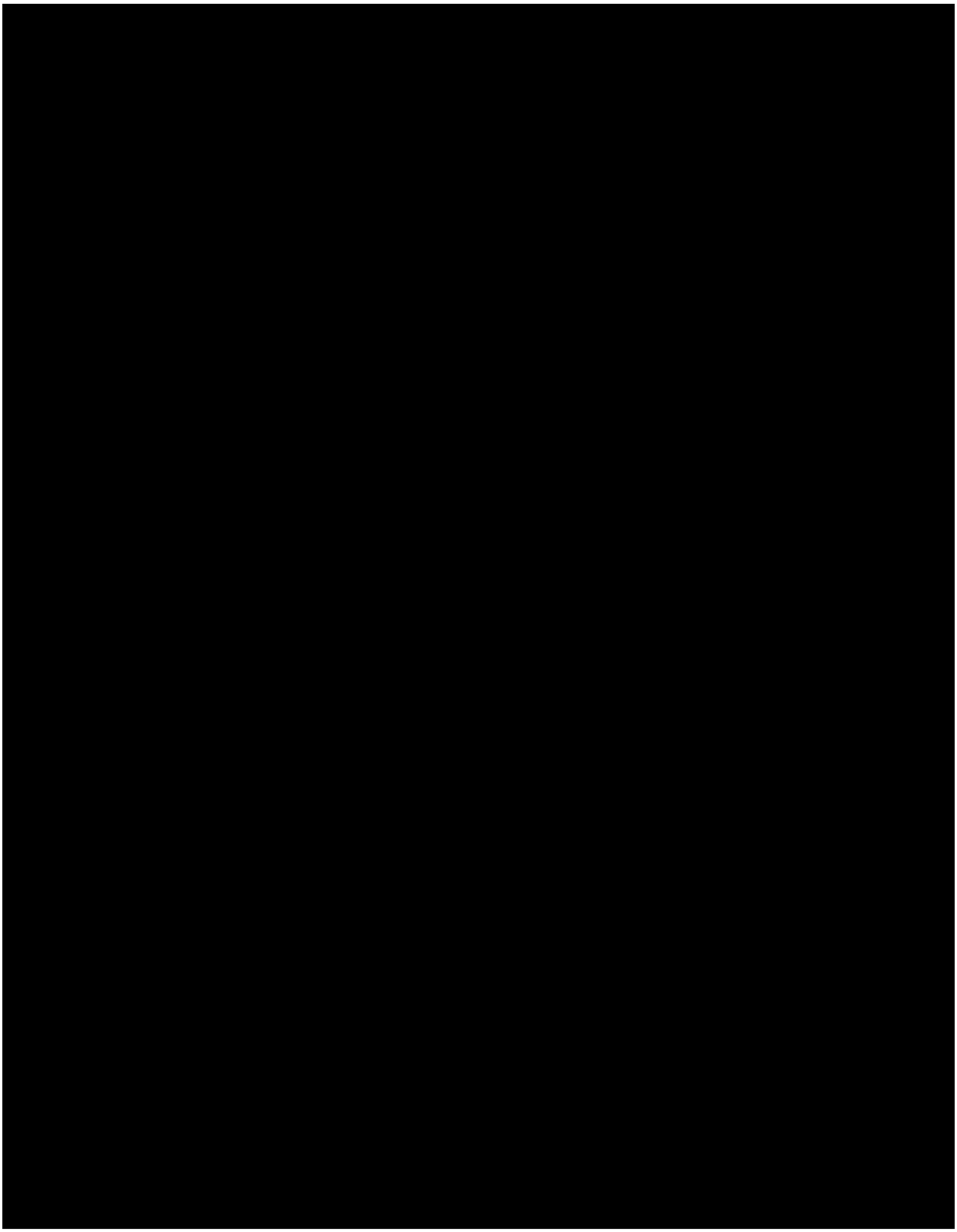


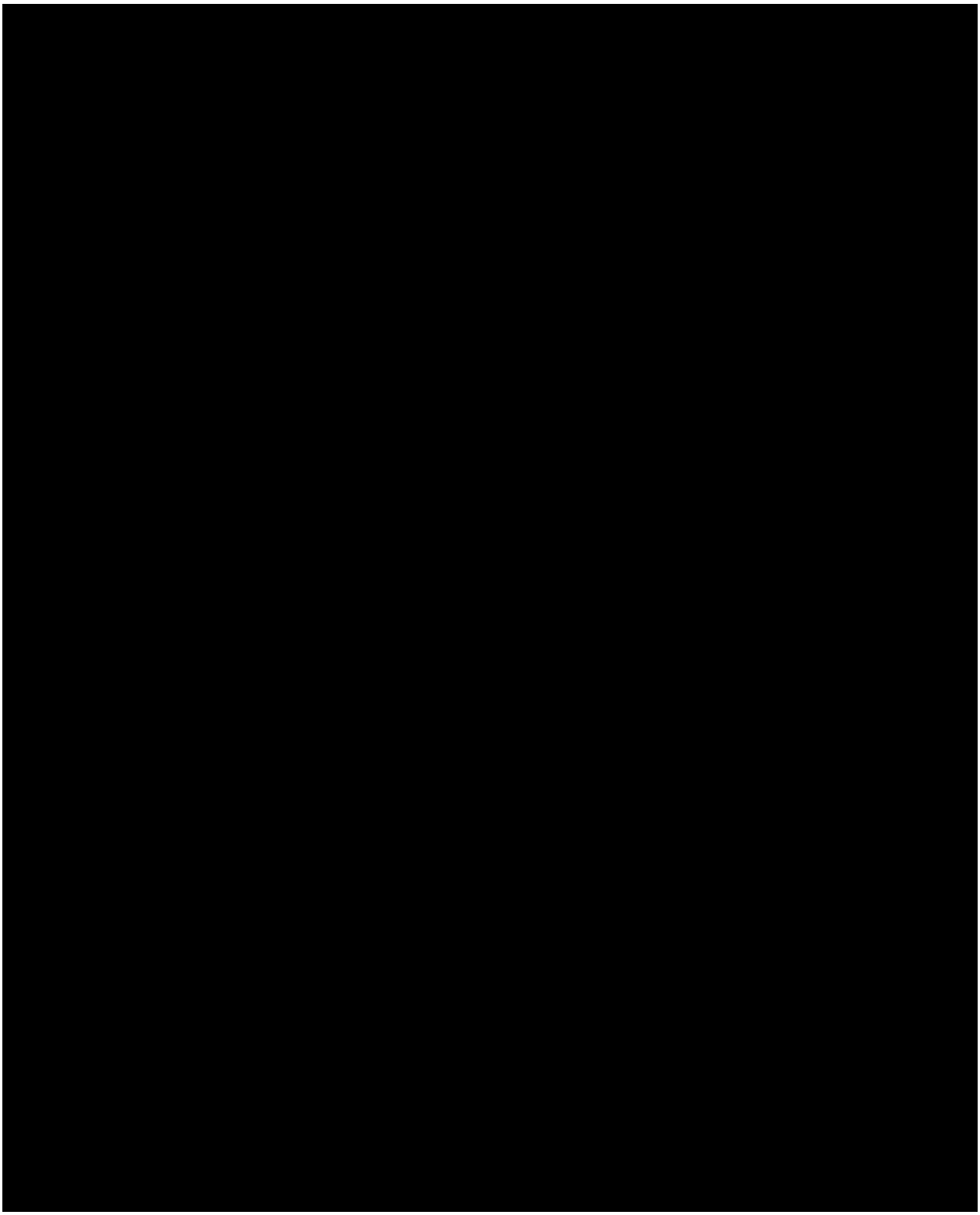


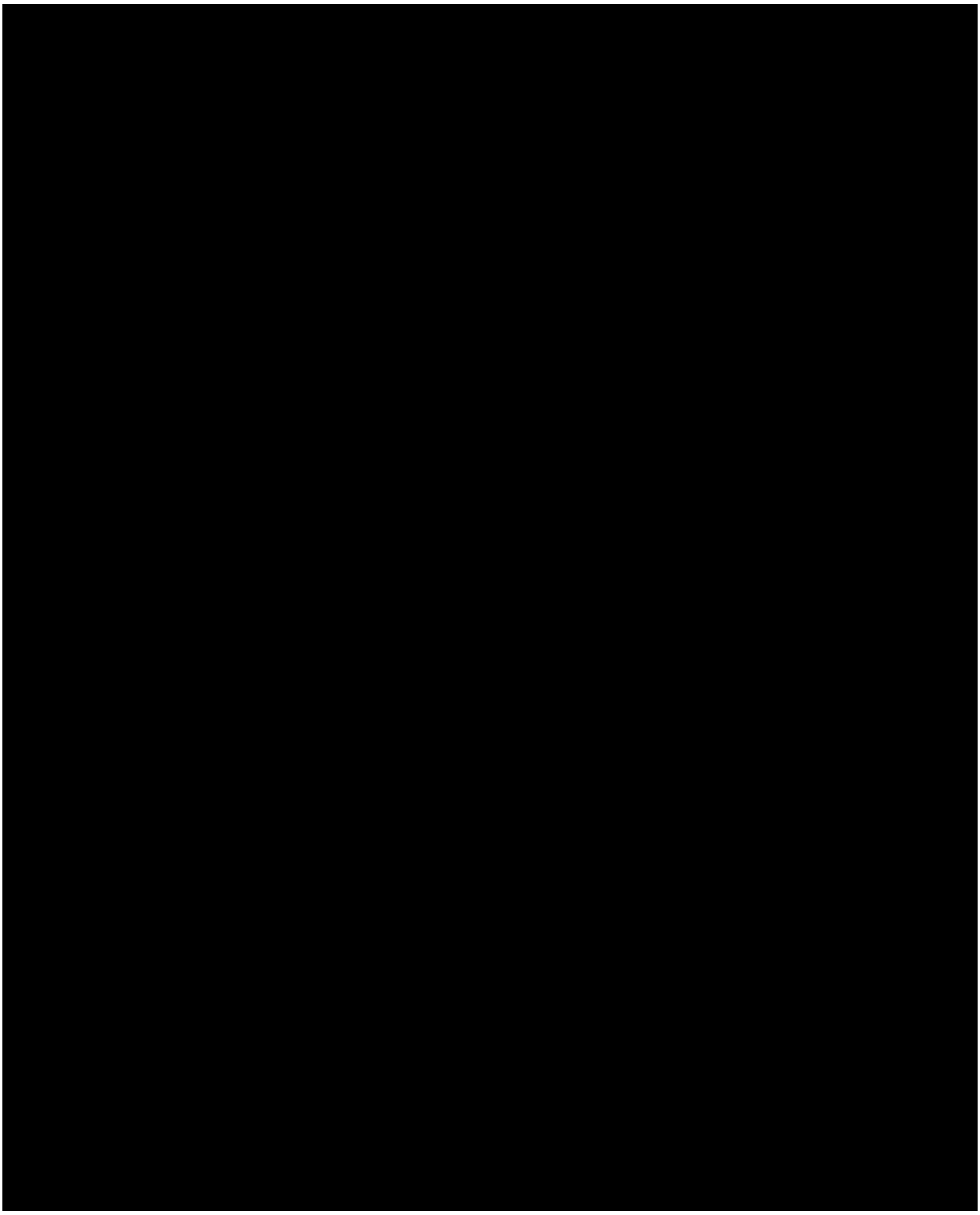


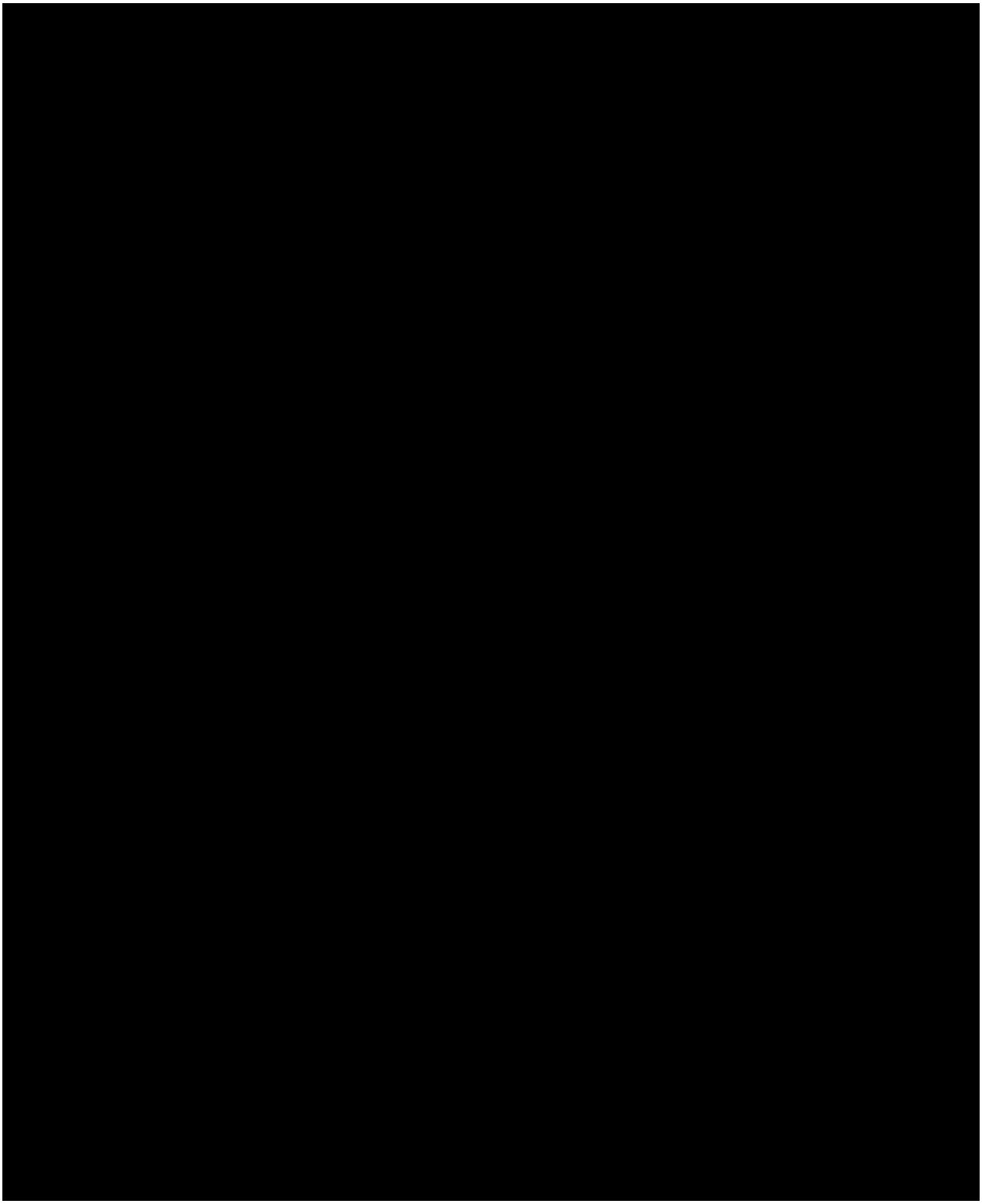


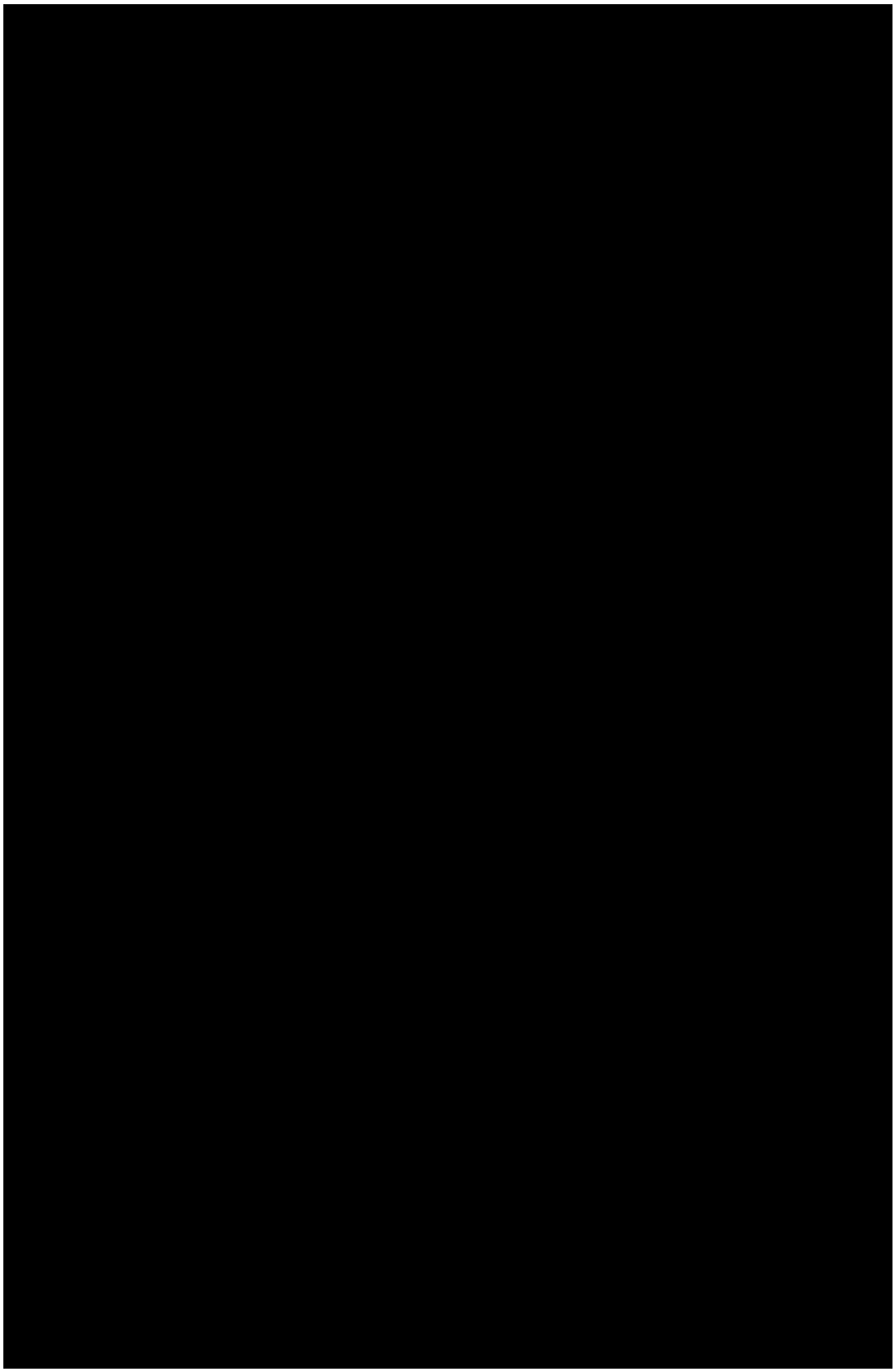


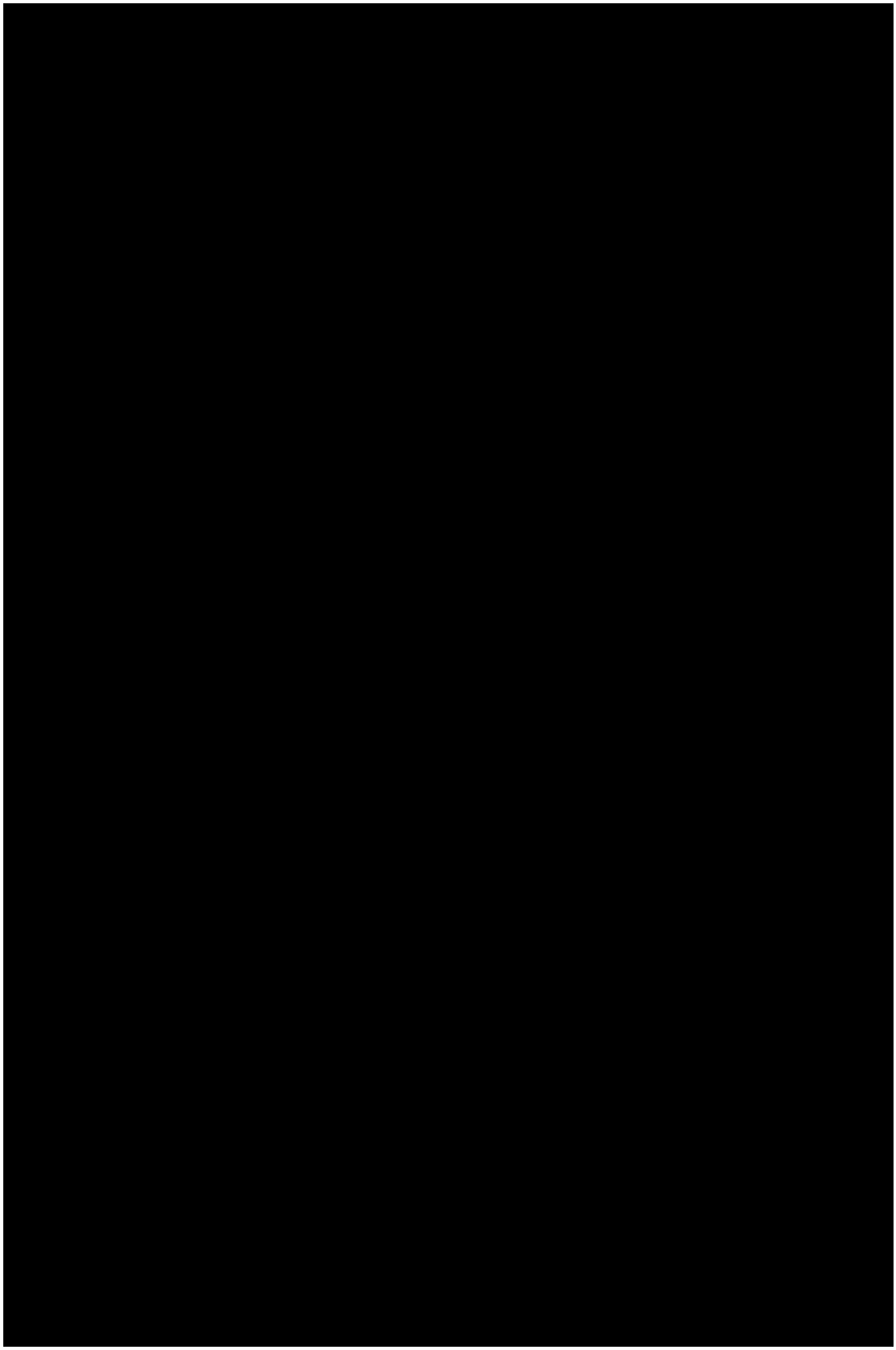












UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

April 10, 1998

In Reply Refer To:
4120, 4000 (240) P

EMS TRANSMISSION 4/10/98
Instruction Memorandum No. 98-91
Expires: 9/30/99

To: AFOs (excluding Alaska and Eastern States)

From: Assistant Director, Renewable Resources and Planning

Subject: Healthy Rangeland Initiative: Implementation of Standards and Guidelines

Standards and guidelines are to be used in several ways. The standards and guidelines and the information gained in assessing standards are an important communication tool. Addressing rangeland health in terms of the standards can aid in identifying the source of problems before they require corrective action and in identifying opportunities for management actions to best meet the standard. Additionally, they provide a clear statement and common understanding of the expected resource conditions and acceptable management practices. This common understanding will allow the livestock operator-and BLM to design management practices and actions to achieve those standards consistent with the guidelines.

The standards and guidelines also define minimum resource conditions that must be achieved and maintained. As provided in the 1995 revisions to the grazing regulations, the BLM must ensure that grazing related actions conform with the appropriate standards and guidelines.

The purpose of this Instruction Memorandum is to--

- provide a brief overview of standards and guidelines implementation as described in the 1995 revisions to the grazing regulations and the 1994 Final Environmental Impact Statement,

- describe your responsibilities in the implementation of standards and guidelines as they pertain to the management of grazing of public lands, and

- introduce the DRAFT IMPLEMENTATION GUIDE.

Below is a series of questions and answers designed to accomplish the first two purposes listed above.

What is the purpose of the standards and guidelines?

The purpose of the standards and guidelines at 43 CFR subpart 4180 is to improve the health of the public rangelands. The standards and guidelines are intended to help the Bureau, rangeland users and others focus on a common understanding of acceptable resource conditions and work together to achieve that vision.

What is a standard?

Standards of rangeland health are expressions of levels of physical and biological condition or degree of function required for healthy, sustainable rangelands and define minimum resource conditions that must be achieved and maintained. Determination of rangeland health is based upon conformance with the standards. Application of the standard to the site considers the potential of the site without regard for the type or levels of use or management actions or decisions.

(Note: Standards may be supplemented with additional requirements where appropriate to meet resource objectives identified in an activity plan or land use plan. However, all resource objectives must, at a minimum, be consistent with the standards for the area.)

What is a guideline?

Guidelines for grazing management are types of grazing management methods and practices determined to be appropriate to ensure that standards can be met or that significant progress can be made toward meeting the standard. Guidelines are tools that help managers and permittees achieve standards. Guidelines implemented under 43 CFR 4180 are specific to livestock grazing. Guidelines are best management practices such as grazing systems, vegetative treatments, or improvement projects which could be used to achieve rangeland health standards.

How do I implement standards and guidelines?

An important aspect of standards and guidelines implementation requires that you ensure that all grazing related actions conform with the appropriate standards and guidelines. As described in the 1995 revisions to the grazing regulations, standards and guidelines implementation involves:

- prioritizing areas to be assessed,
- conducting assessments to determine if assessed areas meet, are making "significant progress" toward or fail to achieve standards or conform with guidelines,
- if failing, determining if grazing is a significant factor,
- if grazing is a significant factor, take appropriate action by modifying the terms and conditions, and
- evaluating the effectiveness of terms and conditions (See attached flow chart).

Standards and guidelines are to be implemented by applying terms and conditions to--

- grazing permits, leases and authorizations;
- grazing-related portions of activity plans (including Allotment Management Plans); and
- range improvement-related activities.

What is an assessment?

"Assessment" means the analysis, synthesis and interpretation of information, including monitoring data, to characterize the health of an allotment or other management unit. It is similar to "evaluation", as frequently used in the rangeland management program. Gathering new information in the field may be necessary as part of the assessment process.

How do I prioritize areas to assess?

You may choose an allotment or a group of allotments as a basis for an assessment or may use some other unit such as a watershed. The unit selected should have common resource characteristics at a scale appropriate to the complexity of the issues.

Prioritize areas by allotments, groups of allotments, watersheds or other areas and set a schedule for addressing them, giving priority to areas believed to be at risk-in degraded condition or downward trend and in danger of losing potential. This basic consideration may be supplemented with local criteria. You must document a clear rationale for selecting the assessment priority and determining the schedule to follow in conducting assessments and taking appropriate actions.

The process for prioritizing allotments or other areas must reflect the full range of physical and biological factors addressed by the standards. Previous allotment categorization (M, I, and C) may be useful in establishing priorities, but remember that the categorization process, in most cases, did not fully consider indicators of health and ecosystem function. You should strive to involve affected permittees and lessees, interested publics, other units of government and Indian tribes throughout the assessments, including activities associated with prioritizing allotments.

What is the goal of the assessment?

The goal of the assessment is to determine if areas are meeting standards and conforming to guidelines or making significant progress toward meeting standards and conforming to guidelines.

What information is needed for an assessment?

Monitoring data collected in the past will often be an important source of information in conducting an assessment, but years of monitoring data are not necessarily required to complete an assessment. To determine whether current management is resulting in meeting the standards, you should use the best data and resource information available to you. This may include quantitative data from monitoring and inventories, qualitative information, professional knowledge, and knowledge provided by State agencies, public land users and others. Decisions must be made on a reasoned and rational basis, supportable, and well documented.

In limited cases, quantitative monitoring data, gathered over a period of years, may be essential in determining whether an area meets the standards or is making significant progress. It is anticipated that in these cases, it could take several grazing seasons to determine direction and magnitude of change. However, it would be inconsistent with our mandate to manage the public rangelands if we were to allow an allotment or watershed to deteriorate while prolonged monitoring studies are conducted. If reliable indicators of rangeland health demonstrate that areas are not meeting or not making significant progress toward meeting standards, you should take appropriate action.

If you determine that inadequate information is available to determine whether areas are meeting standards and conforming to guidelines or making significant progress toward meeting standards and conforming to guidelines, you should, without delay, initiate action necessary to gather the minimum information needed to make the determination.

How long do I have to assess the rangelands under my jurisdiction?

You must complete the assessments in a reasonable time frame. In most states, Authorized Officers should ensure that at least ten percent of the livestock grazing lands under their jurisdiction are assessed each year until the assessments are complete. In states with an extremely large number of allotments, where assessing ten percent of the allotments per year would impose an impossible workload, a longer time-frame may be considered. In all states, the State Director should submit a draft implementation plan to the Assistant Director, WO-200 for approval, by August 1, 1998.

Is an assessment an action that can be protested and appealed under 43 CFR 4160?

No. Assessments are preliminary findings that build an administrative record. 43 CFR 4160 applies to actions (such as the renewal of a permit), terms and conditions, or modifications relating to applications, permits and agreements (including range improvement permits) or leases. As always, any applicant, permittee, lessee or any other person whose interest is adversely affected by a final decision of the authorized officer may appeal as provided in 43 CFR 4.470.

What if I determine an area or allotment is meeting standards and conforming to guidelines or making significant progress toward meeting standards and conforming to guidelines?

If you determine an area or allotment meets the standards and conforms to the guidelines or is making significant progress toward meeting standards and conforming to guidelines, you must--

- review the existing terms and conditions to ensure that they will provide for continued achievement of (or progress towards meeting) the standards and guidelines, and

- continue monitoring and evaluation activities that will provide assurance that the area continues to meet the standards and conform to the guidelines or make significant progress toward meeting standards and conforming to guidelines.

What if I determine an area or allotment is not meeting standards and conforming to guidelines or not making significant progress toward meeting standards and conforming to guidelines?

If you determine an area or allotment fails to meet the standards and conform to the guidelines and is failing to make significant progress toward meeting standards and conforming to guidelines, you must determine if grazing is a significant factor.

What should I consider in determining if grazing is a significant factor in failing to achieve the standards and conform with the guidelines?

You should not assume that existing grazing management practices or levels of grazing use are significant factors in failing to achieve the standards and conform with the guidelines. You should determine if grazing is a factor only after reviewing the best resource information available to you. This may include quantitative data from monitoring and inventories, qualitative information, professional knowledge, and knowledge provided by public land users and others. Actions needed to improve grazing management to conform with guidelines or to meet standards should not be delayed solely because quantitative monitoring data are lacking.

If adequate information is not available to determine whether current livestock grazing is a significant factor in failing to meet the standards for a priority area, you should, without delay, initiate action necessary to gather the minimum information needed to make the determination.

What do I do if grazing is not a significant factor in failing to achieve the standards and conform with the guidelines?

If you determine that existing grazing management practices or levels of grazing use are not significant factor(s) in failing to achieve the standards, you should consult other BLM guidance to revise management to meet the standards.

What do I do if grazing is a significant factor in failing to achieve the standards and conform with the guidelines?

If you determine that existing terms and conditions result in grazing management practices or levels of grazing use that are significant factor(s) in failing to achieve the standards and conform with the guidelines, you must modify the terms and conditions for grazing use.

By when must I modify the terms and conditions?

Upon your determination that existing grazing management practices or levels of grazing use are significant factor(s) in failing to achieve the standards and conform with the guidelines, you must modify the terms and conditions as soon as practicable but no later than the start of the next grazing year (March 1st).

What follows the modification of terms and conditions?

After modifying the terms and conditions, you should evaluate the effectiveness of the modified terms and conditions in meeting the standards and conforming to the guidelines. If future monitoring/evaluations indicate that the area has not achieved or is not making significant progress toward meeting the standards and conforming with the guidelines, again modify the terms and conditions as appropriate.

What are my responsibilities, once areas are meeting standards and conforming to guidelines or making significant progress toward meeting standards and conforming to guidelines?

You have a responsibility to periodically monitor and evaluate areas to ensure they continue to meet the standards and conform to guidelines or to make significant progress toward meeting standards and conforming to guidelines.

While the assessment efforts are ongoing, what do I do when a permit or lease comes up for renewal or transfer for an unassessed allotment?

You should consider the renewal or transfer of a permit or lease to be an opportune time to conduct an assessment of rangeland health and make any needed changes in the terms and conditions. If you do not conduct an assessment of rangeland health when a permit or lease is renewed or transferred, you must include terms and conditions that ensure achievement of the standards and conformance with appropriate guidelines. These terms and conditions must include a statement that if an assessment results in a determination that changes are necessary in order to comply with the standards and guidelines, the permit (or lease) will be reissued subject to revised terms and conditions.

The term of grazing permits or leases shall be for ten years, unless one of the exceptions listed in 43 CFR 4130.2(d) applies. Permits or leases may be revised if additional information indicates changes in management are needed to ensure allotments or areas are meeting standards and conforming to guidelines or making significant progress toward meeting standards and conforming to guidelines.

How do standards and guidelines affect low priority allotments?

It may not be possible to complete assessments and take appropriate action within the near future for low priority allotments. Given workloads and priorities, it is conceivable that some allotments may never have terms and conditions specific to that allotment and that the general requirement to be in compliance with the standard is all that ever appears on the permit or lease. Regardless, in the event that grazing is determined to be a significant contributing factor in failing to achieve the standards or conform with the guidelines on a low priority allotment, you are required to take appropriate action under 43 CFR 4180.

How does standards and guidelines implementation affect our NEPA responsibilities?

The NEPA analysis for most State or regional standards and guidelines has been completed. However, as has long been the case, you must ensure NEPA compliance as terms and conditions are modified to ensure the terms and conditions result in meeting the standards and conforming to the guidelines or making significant progress toward meeting the standards and conforming to the guidelines.

How will we keep track of our efforts?

You must submit, by State, a progress report by October 15th of each year. You will be required to report by allotments and acreage the status of your implementation efforts. The format is provided in the attached DRAFT IMPLEMENTATION GUIDE, STANDARDS AND GUIDELINES FOR HEALTHY RANGELANDS

Summary

You need to move promptly to implement standards and guidelines and to take needed actions to improve rangeland health. 43 CFR subpart 4180 was written to achieve positive, on-the-ground changes in resource conditions. Development and approval of standards has been a significant accomplishment, but without full and effective implementation, it will be meaningless. Our goal as managers of the public rangelands must be to improve rangeland health and provide for multiple use and sustained yield of these lands. Implementation of the standards and guidelines is a critical means to reach that goal.

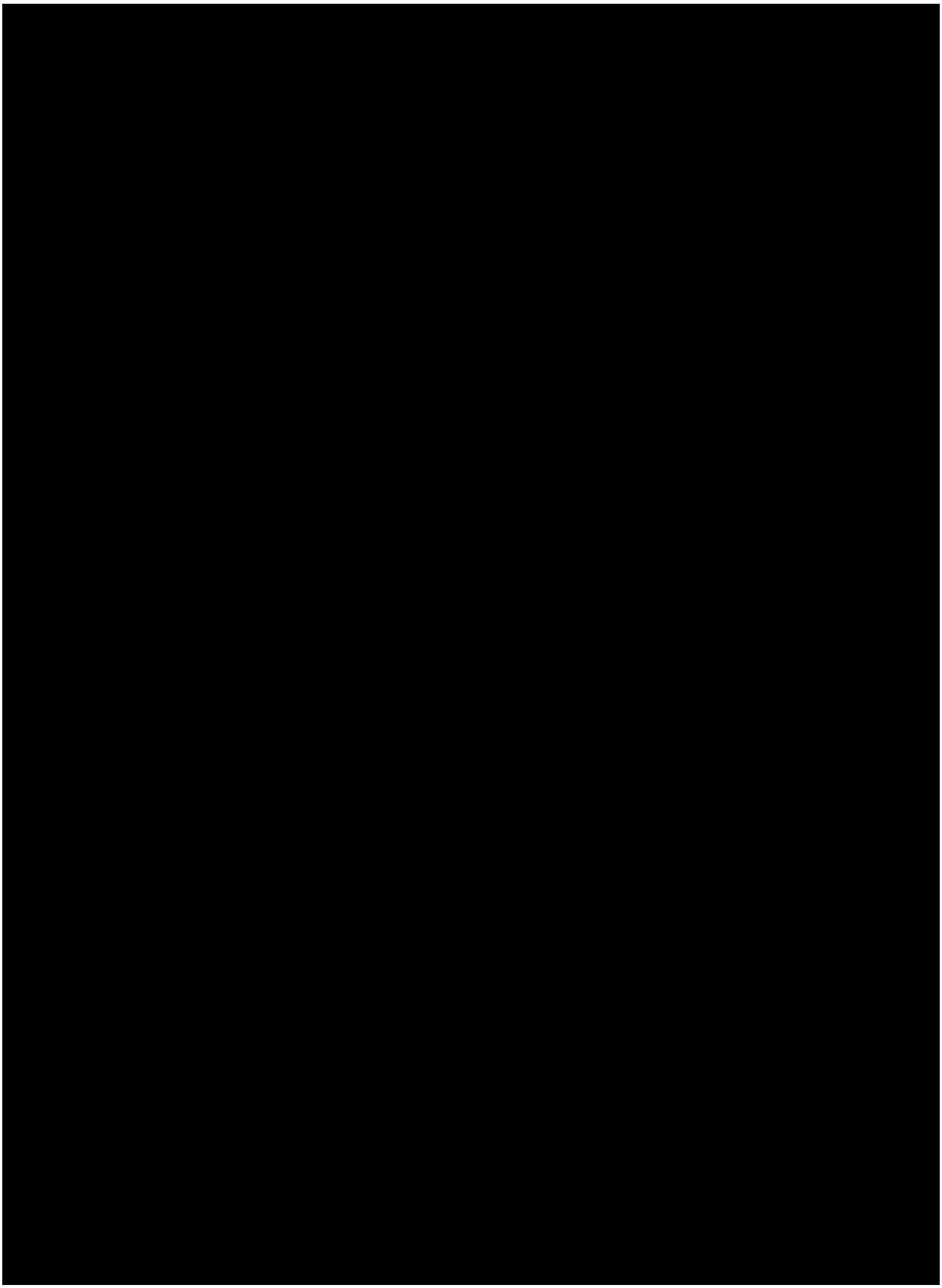
The overall purpose of the standards and guidelines is, in working with permittees, lessees and the public to make a difference on the land. Success will be measured in terms of concrete outcomes--not in terms of procedural actions. Success will be registered in recovering riparian areas, improved habitat conditions for wildlife, cleaner water, stabilized soils, robust native vegetation populations and sustainable livestock grazing operations. Procedural actions--plans written, data gathered, projects initiated, protests resolved or status reports filed--are merely means to an end. They are not, in and of themselves, the things about which our public cares. And they are not, in themselves, evidence of success. Our job is to change things on the land.

The attached DRAFT IMPLEMENTATION GUIDE, STANDARDS AND GUIDELINES FOR HEALTHY RANGELANDS and Standards and Guidelines Implementation Flow Chart is intended to assist managers and all employees responsible for implementing standards and guidelines.

Signed by:
Maitland Sharpe
Assistant Director
Renewable Resources and Planning

Authenticated by:
Robert M. Williams
Directives, Records
& Internet Group,W0540

2 Attachments
1 - The Standards and Guidelines Implementation Flow Chart (1 p)
2 - DRAFT IMPLEMENTATION GUIDE. (10 pp)



BUREAU OF LAND MANAGEMENT
DRAFT IMPLEMENTATION GUIDE
STANDARDS AND GUIDELINES FOR HEALTHY RANGELANDS

Sections

I. Policy Statement

> *The overall purpose of the standards and guidelines is, in working with permittees, lessees and the public, to make a difference on the land The success will be measured in terms of concrete outcomes--not in terms of procedural actions. Success will be registered in recovering riparian areas, improved habitat conditions for wildlife, cleaner water, stabilized soils, robust native vegetation populations and sustainable livestock grazing operations. Procedural actions--plans written, data gathered, projects initiated, protests resolved or status reports--are merely means to an end. They are not, in and of themselves, the things about which our public cares. And they are not, in themselves, evidence of success. Our job is to change things on the land.*

II. Definitions

Appropriate Action - means implementing actions pursuant to subparts 4110, 4120, 4130, and 4160 of [the grazing regulations] that will result in significant progress toward fulfillment of the standards and significant progress toward conformance with the guidelines. [4180.2(c)]

Authorized Officer -- is used to denote specific responsibilities of management personnel.

You

Significant Progress--movement toward meeting standards and conforming to guidelines that is acceptable in terms of rate and magnitude. Acceptable levels of rate and magnitude must be realistic in terms of the capability of the resource, but must also be as expeditious and effective as practicable.

Significant Factor --a principal cause in the failure to achieve the standards and conform with the guidelines. A significant factor would typically be a use that, if modified, would enable an area to achieve or make significant progress toward achieving the standards. To be a significant factor, a use may be one of several factors contributing to less-than-healthy conditions; it need not be the sole factor inhibiting progress towards the standards.

III. Standards and Guidelines Implementation

Implementing standards and guidelines requires that Authorized Officers--

1. prioritize areas and set an assessment schedule,

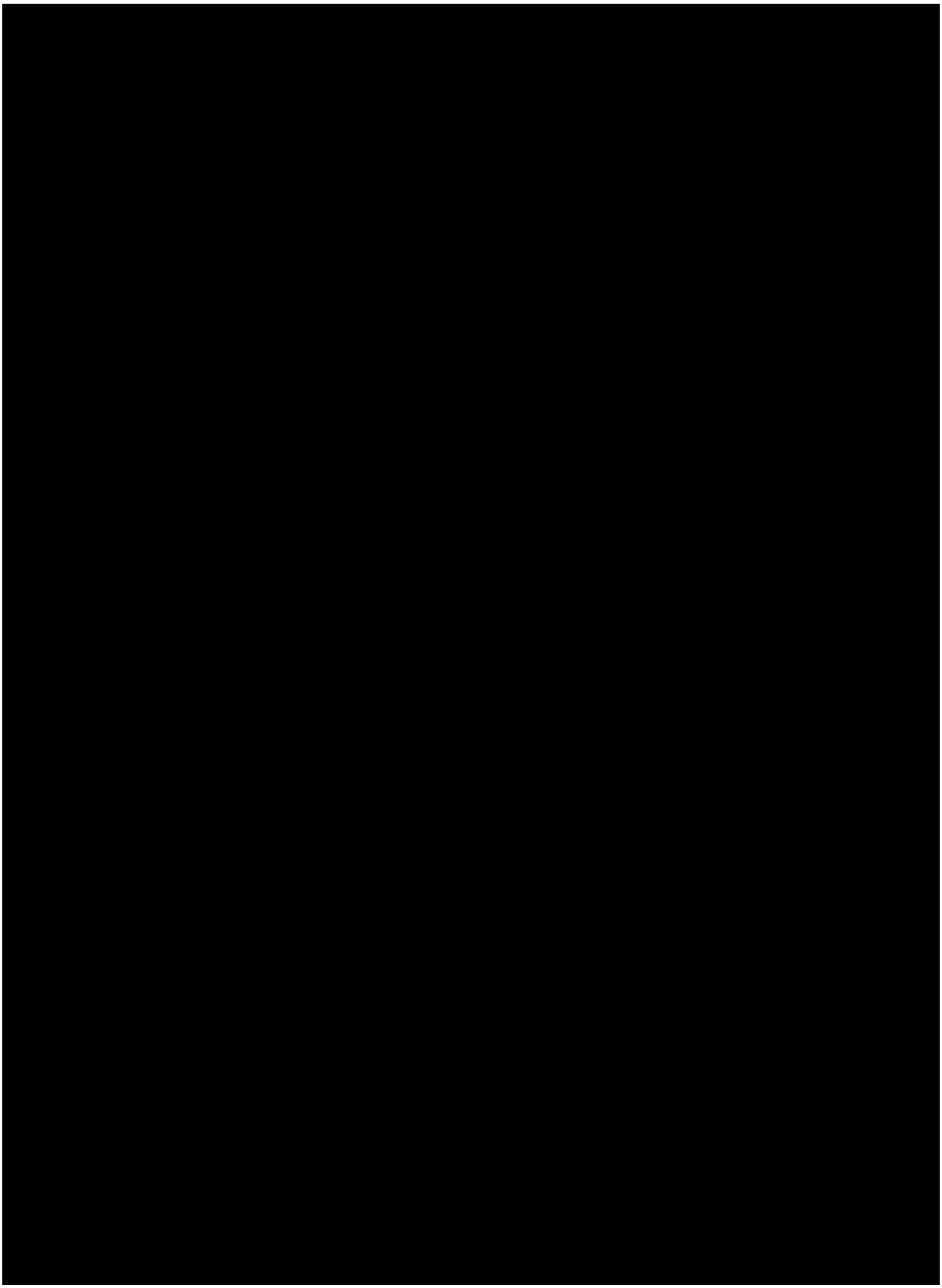
2. conduct assessments and make "meets, significant progress or fails" determinations,

3. if fails, determine if grazing is a significant factor,

4. if grazing is a significant factor, take appropriate action by modifying the terms and conditions, and

5. evaluate effectiveness of the revised management.

The Standards and Guidelines Implementation Flow Chart graphically portrays the sequence of implementation.



Each step in implementing the standards and guidelines is described in greater detail below.

1. Prioritizing Areas and Setting Assessment Schedule

Prioritize areas by allotments, groups of allotments, watersheds or other areas and set a schedule for addressing them, giving priority to areas believed to be at risk--in degraded condition or downward trend and in danger of losing potential.

The preamble to the 1995 grazing regulations states "...it is not possible to complete assessments of rangeland health and to take appropriate corrective action ... immediately upon completion of the...standards and guidelines … The Department intends that assessments and corrective actions will be taken in priority order as determined by BLM."

Authorized Officers are responsible for determining the priority order for conducting assessments and carrying out needed actions. You must document a clear rationale for selecting the assessment priority and determining the schedule to follow in conducting assessments and taking appropriate actions.

The assessment must be completed in a reasonable time frame. In most States, Authorized Officers should ensure that at least ten percent of the livestock grazing lands under their jurisdiction are assessed each year until the initial round of assessments is complete. In States with an extremely large number of allotments, where assessing ten percent of the allotments per year would impose an impossible workload, a somewhat longer time-frame may be considered. In all States, the State Director should submit a draft implementation plan to the Assistant Director, WO-200 for approval, by August 1, 1998.

The process for prioritizing allotments or other areas must reflect the full range of physical and biological factors addressed by the standards. Previous allotment categorization (M, I, and C) may be useful in establishing priorities, but remember that the categorization process, in most cases, did not fully consider indicators of health and ecosystem function. For example, in determining the priority order for allotments or other areas, you should review the State 303(d) list. The Clean Water Act requires the State water quality management agency to bi-annually identify surface waters that are not meeting water quality standards. Priority should be given to allotments or areas where grazing-related water quality issues exist, particularly for those that lack the application of appropriate Best Management Practices (BMP). You should also review all areas with habitat for known threatened, endangered, or special status species and evaluate their priority for assessment and corrective action.

The renewal or transfer of a permit or lease may be an opportune time to conduct an assessment of rangeland health and make any needed changes in the terms and conditions. If you do not conduct an assessment of rangeland health when a permit or lease is renewed or transferred, you must include terms and conditions that ensure achievement of the standards and conformance with appropriate guidelines. These terms and conditions must include a statement that if an assessment results in a determination that changes are necessary in order to comply with the standards and guidelines, the permit (or lease) will be reissued subject to revised terms and conditions. Suggested language:

The terms and conditions of your permit (or lease) may be modified if additional information indicates that revision is necessary to conform with 43 CFR 4180.

Authorized Officers may choose the allotment or a group of allotments as the basis for assessments or may use some other unit such as a watershed. The unit selected should have common resource characteristics at a scale appropriate to the complexity of the issues.

The process for prioritizing allotments or other areas must reflect the full range of physical and biological factors addressed by the standards. Previous allotment categorization (M, I, and C) may be useful in establishing priorities, but remember that the categorization process, in most cases, did not fully consider indicators of health and ecosystem function.

You should strive to involve affected permittees and lessees, interested publics, other units of government and Indian tribes throughout the assessments, including activities associated with prioritizing allotments.

2. Conducting Assessments

Following the priority schedule, conduct assessments to determine whether the areas are meeting standards and conforming to guidelines or making significant progress toward meeting standards and conforming to guidelines.

The purpose of assessing an allotment, or other areas for rangeland health is to determine whether standards are being met and guidelines followed. Monitoring data collected in the past will often be an important source of information in conducting an assessment, but years of monitoring data are not a required for conducting an assessment.

"Assessment" means the analysis, synthesis and interpretation of information, including monitoring data, to characterize the health of an allotment or other management unit. It is similar to "evaluation", as frequently used in the rangeland management program. Gathering new information in the field may be necessary as part of the assessment process. "Monitoring" means the periodic gathering of information.

To determine whether current management is resulting in meeting the standards, you should use the best data and resource information available to you. This may include quantitative data from monitoring and inventories, qualitative information, professional knowledge, and knowledge provided by State agencies, public land users and others. You should gather additional field information only where it is needed to determine if standards are being met and what appropriate action to take in order to move resource conditions toward the standards.

In limited cases, quantitative monitoring data, gathered over a period of years, may be essential in determining whether an area meets the standards or is making significant progress. It is anticipated that in these cases, it could take several grazing seasons to determine direction and magnitude of change. However, actions will be taken to establish significant progress toward conformance as soon as sufficient information is available to indicate a need for changes in grazing practices.

Quantitative monitoring data are not always required to make those determinations nor to implement actions to improve livestock grazing management. It would be inconsistent with our mandate to manage the public rangelands if we were to allow an allotment or watershed to deteriorate while prolonged monitoring studies are conducted. If reliable indicators of rangeland health demonstrate that areas are not meeting or not making significant progress toward meeting standards, you should take appropriate action.

If you determine that inadequate information is available to determine whether areas are meeting standards and conforming to guidelines or making significant progress toward meeting standards and conforming to guidelines, you should, without delay, initiate action necessary to gather the minimum information needed to make the determination. Generally, resource information or data collected should be tied directly to the standards and guidelines.

In assessing the health of rangelands to determine whether action of the authorized officer is necessary, consider the extent to which standards are being met and guidelines followed across the area of a grazing allotment or group of allotments. Failure to comply with a standard in an isolated area will not necessarily mean the area being assessed is failing to meet the standards or requires a corrective action. This exception would not apply if the isolated area is of significant ecological importance or if water quality standards are not being met.

At the end of the assessment, you must determine that the area being assessed--

1. meets the standards and conforms to the guidelines or is making significant progress toward meeting standards and conforming to guidelines, or

2. fails to meet the standards and conforms to the guidelines and is failing to make significant progress toward meeting standards and conforming to guidelines.

If you determine the area meets the standards and conforms to the guidelines or is making significant progress toward meeting standards and conforming to guidelines, you must--

1. review the existing terms and conditions to ensure that they will provide for continued achievement of (or progress towards meeting) the standards and guidelines, and

2. plan for monitoring and evaluation activities to provide long-term assurance that the area continues to meet, or make significant progress toward meeting, the standards.

If you determine the area fails to meet or make significant progress toward meeting the standards and conforming to the guidelines, you must proceed to step 3 below, "Determine If Grazing Is a Factor."

3. Determine If Grazing Is a Factor

For areas determined to be not meeting standards and conforming to guidelines and failing to make significant progress toward meeting standards and conforming to guidelines, determine if existing grazing management practices or levels of grazing use are significant factors in failing to achieve the standards and conform with the guidelines.

You should not assume that existing grazing management practices or levels of grazing use are significant factors in failing to achieve the standards and conform with the guidelines. You should determine if grazing is a factor only after reviewing the best data and resource information available to you. This may include quantitative data from monitoring and inventories, qualitative information, professional knowledge, and knowledge provided by public land users and others.

If inadequate information is available to determine whether current livestock grazing is a significant factor in failing to meet the standards for a priority area, you should, without delay, initiate action necessary to gather the minimum information needed to make the determination.

Determining if grazing is a factor should employ the minimum information needed to decide whether livestock grazing is a significant factor in the failure to meet the standards or conform to the guidelines. Collecting additional data in the field is not an end in itself. The goal is to use information to work with permittees, lessees and the public to improve resource conditions and to ensure that standards for rangeland health are being met at the earliest possible date.

If you determine that existing grazing management practices or levels of grazing use are significant factor(s) in failing to achieve the standards and conform with the guidelines, you must proceed to step 4 below, "Taking appropriate action by modifying the terms and conditions."

If you determine that existing grazing management practices or levels of grazing use are not significant factor(s) in failing to achieve the standards, you should consult other BLM guidance to revise management to meet the standards.

4. **Taking appropriate action by modifying the terms and conditions**

If existing grazing management practices or levels of grazing use are significant factors in failing to achieve the standards and conform with the guidelines, you must, in consultation with permittees, lessees, the State and interested public, take appropriate action and modifying the terms and conditions by the start of the next grazing season to ensure the terms and conditions result in meeting the standards and conforming to the guidelines or making significant progress toward meeting the standards and conforming to the guidelines.

Terms and conditions are the prescription for applying standards and guidelines to a specific permit or lease. For example, a standard to maintain healthy, productive plant and animal communities at viable population levels could be addressed by a guideline requiring appropriate rest during the growing season. A term and condition of the permit or lease may list specific dates pastures must be rested, or require the operator to follow a specific grazing plan.

Range improvement permits and cooperative range improvement agreements are also management tools used to improve resource conditions and achieve livestock management objectives. Range improvement projects must be consistent with standards and guidelines. Any range improvement permits and cooperative range improvement agreements must include terms and conditions needed to ensure achievement of standards and conformance with guidelines. uthor

A decision to modify the terms and conditions of a grazing permit or lease must be in conformance with the land use plan and must be supported by appropriate NEPA analysis. If the terms and conditions modifications have been previously addressed in the NEPA analysis for an allotment management plan, a similar type activity plan, or a related decision document, this NEPA analysis should be evaluated to determine its adequacy. If the previous analysis does not adequately cover the proposed terms and conditions modifications, a new NEPA document must be prepared. The new document may tier to, supplement, or incorporate by reference, parts of or all of an existing NEPA document.

5. **Evaluate Effectiveness**

Evaluate the effectiveness of management under the modified terms and conditions in meeting the standards and conforming to the guidelines. If further monitoring and evaluation indicate that the area has not achieved or is not making significant progress toward meeting the standards and conforming with the guidelines, further modify the terms and conditions by the start of the next grazing season, in consultation with permittees, lessees, the State and interested public, to ensure the terms and conditions result in meeting the standards and conforming to the guidelines or making significant progress toward meeting the standards and conforming to the guidelines.

After you have completed the initial assessment and taken appropriate action, gather information on a periodic basis to determine whether the appropriate action is achieving the desired resource conditions. Modify terms and conditions of the permit or lease, as needed, to achieve the standards and maintain significant progress toward the desired resource condition.

IV. Report

Authorized Officers must submit, by State, assessment progress each year as part of the National Rangeland Inventory, Monitoring and Evaluation Report.

Authorized Officers must submit, by State, the following information by October 15, of each year as part of the National Rangeland Inventory, Monitoring and Evaluation Report:

Number Of Allotments Assessed

Number of Acres Assessed (Public)

	Number of Allotments Assessed		Number of Acres Assessed (Public)	
	Current Year	Cumulative	Current Year	Cumulative
Rangelands meeting all standards or making significant progress toward meeting the standards				
Rangelands not meeting all standards or making significant progress toward meeting the standards, but appropriate action has been taken to ensure significant progress toward meeting the standards (livestock is a significant factor)				
Rangelands not meeting standards or making significant progress toward meeting the standards -no appropriate action has been taken to ensure significant progress toward meeting the standards (livestock is a significant factor)				
Rangelands not meeting all standards or making significant progress toward meeting the standards due to causes other than livestock grazing				
Total assessed				
Total not assessed				
Total Allotments / Acres				

June1998

Western Regional Conference
National Cooperative Soil Survey

RE: NATIONAL SOCIETY OF CONSULTING SOIL SCIENTISTS

Dear Fellow Soil Scientists,

Our profession is evolving rapidly and there are tremendous new opportunities for soil scientists in the private sector. Although most soil science positions have been in government or university settings, many predict a dramatic increase in consulting soil scientists. To help prepare yourself for the future, I would like to introduce you to the National Society of Consulting Soil Scientists (NSCSS). Whether you want to be a full-time consultant or just augment your current job or retirement income, you can make important contributions to society. Some benefits of NSCSS membership include:

- A place to find out what private soil scientists are doing and the wide range of work options.
- Information on how to start a business, keep it going and expand into new areas.
- Professional liability insurance at bargain rates.
- Annual meetings with education, business development, recreation and other components.
- A registration program giving soil scientists credibility similar to professional engineers and others.
- A memorandum of understanding with NRCS which provides recognition and cooperation.
- One of the best newsletters around--full of ideas, contacts, upcoming events and other information.
- A place to give back something to the profession that has provided us our livelihoods.
- A great group of interesting, entertaining, dynamic individuals who are making a difference (yes - soil scientists!).

I began my career mapping soils for several agencies. In 1980 1 left government service and developed a business which now employs over 20 professionals, technicians and support staff. We conduct a tremendous variety of soil projects as well as surface and groundwater hydrology, environmental engineering, stream restoration, mine reclamation, wetlands, water rights, crop management and many more. Our staff includes full-time consultants as well as over 30 'associates' who work as needed on specific projects. Our part-time associates include retired agency personnel who don't want to run an entire business but have incredible expertise to offer specific projects. There's been a lot of work but also a lot of satisfaction and fun.

I encourage you to join NSCSS and attend our next annual meeting in Washington, D.C. January 26-29, 1998. We will then switch to a fall meeting date in order to hold our next meeting in conjunction with the SSSA at Salt Lake City November 1999. Come join us in celebrating the soil survey centennial at one of these events. Even if you cannot attend the meeting, our newsletter will introduce you to what's happening in the world of private soil science. You can join as a full member or as an associate. You may or may not choose to become registered. Call me if I can answer any questions or stop by when you're in Missoula. Good luck to all follow soil enthusiasts!

Sincerely,

Barry L. Dutton - President, Land & Water Consulting Inc.
Registered Professional Soil Scientist - NSCSS
Certified Professional Soil Scientist - ARCPACS

OTHER RECENT NSCSS ACTIVITIES

1998 NATIONAL COOPERATIVE SOIL SURVEY REGIONAL CONFERENCES
NSCSS members are attending these conferences to increase communication with NCSS cooperators and offer support for programs and budgets. We also will encourage more soil scientists to consider consulting and more agencies to consider contracting with the private sector Barry Dutton will attend the western conference, Arville Touchete, will attend the southeast and Ken Stevens the northeast. President Donn Smith will attend the annual meeting of the NSCC Advisory Group to the Soil Survey Division of NRCS.

SOIL SURVEY CENTENNIAL
Barry Dutton (President elect) and Donn Smith (President) are on the Soil Survey Centennial Marketing Team and have contributed ideas such as the focus message for educators:

- ***Soil is the living link that ties the natural world together.***

And the focus message for federal and state legislative staffs:

- ***The soil survey is the most valuable natural resource database in the world.***

We look forward to helping NRCS, NCSS and others celebrate the centennial at national meetings and by helping organize event in our own states. (ex Montana will have the first state-wide soil scientist meeting in over a decade)

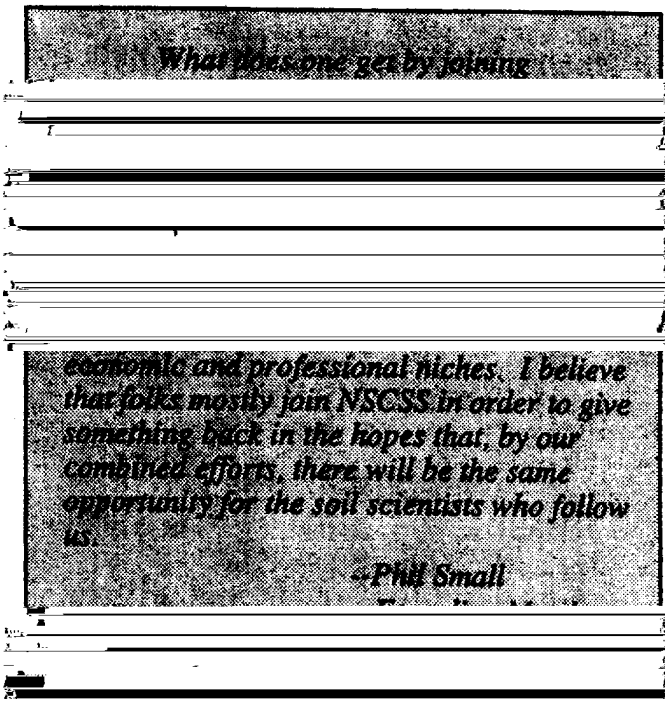
MEMBERSHIP
Increased membership committee efforts have paid off with over 50 new members so far in 1998.

COMMITTEES
Committees have been more active than ever and now include:

Annual Competitions
Archaeological
Business and Marketing
Bylaws and Resolutions
Candidate Evaluation
Earth Collapse Safety
Education
Ethics and Professional Conduct
Expert Witness Testimony
Executive Committee
High Resolution Soil Survey
Hydric Soils
Membership
Model Ordinances for Utilizing Soils in Land Development
Newsletter
Nominating
Nutrient Management
Precision Agriculture
State Licensing
Student Involvement
Technical Advisory

NATIONAL SOCIETY

- Technical and Business Support
- Career Placement Assistance
- NSCSS Registry Eligibility
- Networking with Consulting Soil Scientists across the Country
- Leadership Opportunities
- Input to National and Regional Issues



NSCSS Goals

Technical Communication

- **Distribution of National Cooperative Soil Survey updates**
- **Sharing and formulation of standards and methods**
- **Exchange of information, new ideas and practical solutions**

Professional Growth

- **Education in Business Management**
- **Guidance in providing expert witness and professional testimony**
- **Announcement of training opportunities and conference presentations**
- **Encouraging students to select career paths in soil science**
- **Establishing college curriculum requirements for soil scientists and related majors**

Business Development

- **Minimizing business and professional liability**
- **Identifying new markets and expanding services for clients**
- **Assistance in contracting services and marketing techniques**
- **Sharing experiences in obtaining financing, legal matters, and promotions**

National Leadership

- **Promoting soil science technology and professional registry**
- **Supporting initiation and improvement of state registration programs**
- **Support and enforcement of a code of professional and ethical conduct**
- **Elimination of unfair competition from taxpayer-supported entities**
- **Assist in national level policy formation**

Code of Ethics and Professional Conduct

(Condensed from the NSCSS Code of Ethics and Professional Conduct Guidelines for Consulting Soil Scientists)

Consulting Soil Scientists are committed to the application of all disciplines of professional soil science services for clients on a fee basis. In fulfilling this commitment, Consulting Soil Scientists work with people, programs, government and academic institutions, and businesses. Consulting Soil Scientists may be called upon to provide exploration, assessment, information, evaluation, and other services. Moreover, Consulting Soil Scientists must adhere to ethical standards of professional conduct and must ensure that the standards are enforced vigorously.

Moral and Legal Standards. Consulting Soil Scientists shall behave in a legal, ethical, and moral manner in the conduct of their profession, maintaining the Integrity of the Code and avoiding any behavior which would cause harm to the public or the environment.

Client Relationships. Consulting Soil Scientists shall respect the integrity and protect the welfare of the public and the environment.

Professional Relationships. Consulting Soil Scientists shall act with integrity in their relationships with colleagues, other organizations, agencies, institutions, referral sources, and other professions so as to facilitate the contribution of all specialists toward achieving optimum benefit for the public and the environment.

Public Statements/Fees. Consulting Soil Scientists shall adhere to professional standards in establishing fees and promoting their services.

Confidentiality. Consulting Soil Scientists shall respect the confidentiality of information obtained from others in the course of their work.

Interpretation and Assessment. Consulting Soil Scientists shall endeavor to use the best available knowledge and techniques in the agreed upon work.

Research Activities. Consulting Soil Scientists shall assist in efforts to expand the knowledge of the soil science profession.

Competence. Consulting Soil Scientists shall establish and maintain their professional competencies at such a level that their clients receive the benefit of the highest quality of services the professional is capable of offering.

Registration of Consulting Soil Scientists. Consulting Soil Scientists holding the Registered Professional Soil Scientist (RPSS) designation shall honor its integrity and respect the limitations placed upon its use.

Society Conduct. Consulting Soil Scientists shall represent the National Society of Consulting Soil Scientists in a moral, ethical, and legal manner.

Membership Guidelines

Eligibility: an independent professional soil scientist who performs one or more of the disciplines of professional soil science services for clients on a fee basis. A consulting soil scientist is qualified by education, ability, and experience to provide competent soil science consulting and must:

1) Actively provide soil science service in the private sector as their primary profession, either as a consultant or as an employee of a consulting or research firm;

2) Utilize standards set forth by the National Cooperative Soil Survey (NCSS) procedures in the conduct of field soil science consulting activities, and/or utilize standard published soil testing laboratory procedures in the conduct of laboratory soil science consulting activities;

3) Hold at least a Bachelor of Science degree from an accredited college or university with a minimum of thirty (30) semester hours, or equivalent quarter hours, in agricultural, biological, or physical and earth sciences, in addition to at least 15 semester hours, or equivalent quarter hours, in soil science. Alternatively, an individual lacking the requisite credit hours, but in possession of at least a Bachelor of Science degree, and having acquired at least 5 years experience as a professional soil scientist, under the supervision of a qualified soil scientist may also qualify.,

Categories of Membership

NSCSS has five categories of membership:

Member Firm - Businesses whose principals are Regular Members and, as such, are qualified as Consulting Soil Scientists. Member Firms form the backbone of NSCSS.

Member Chapters - Groups of Regular and Associate Members from regional and state-wide areas.

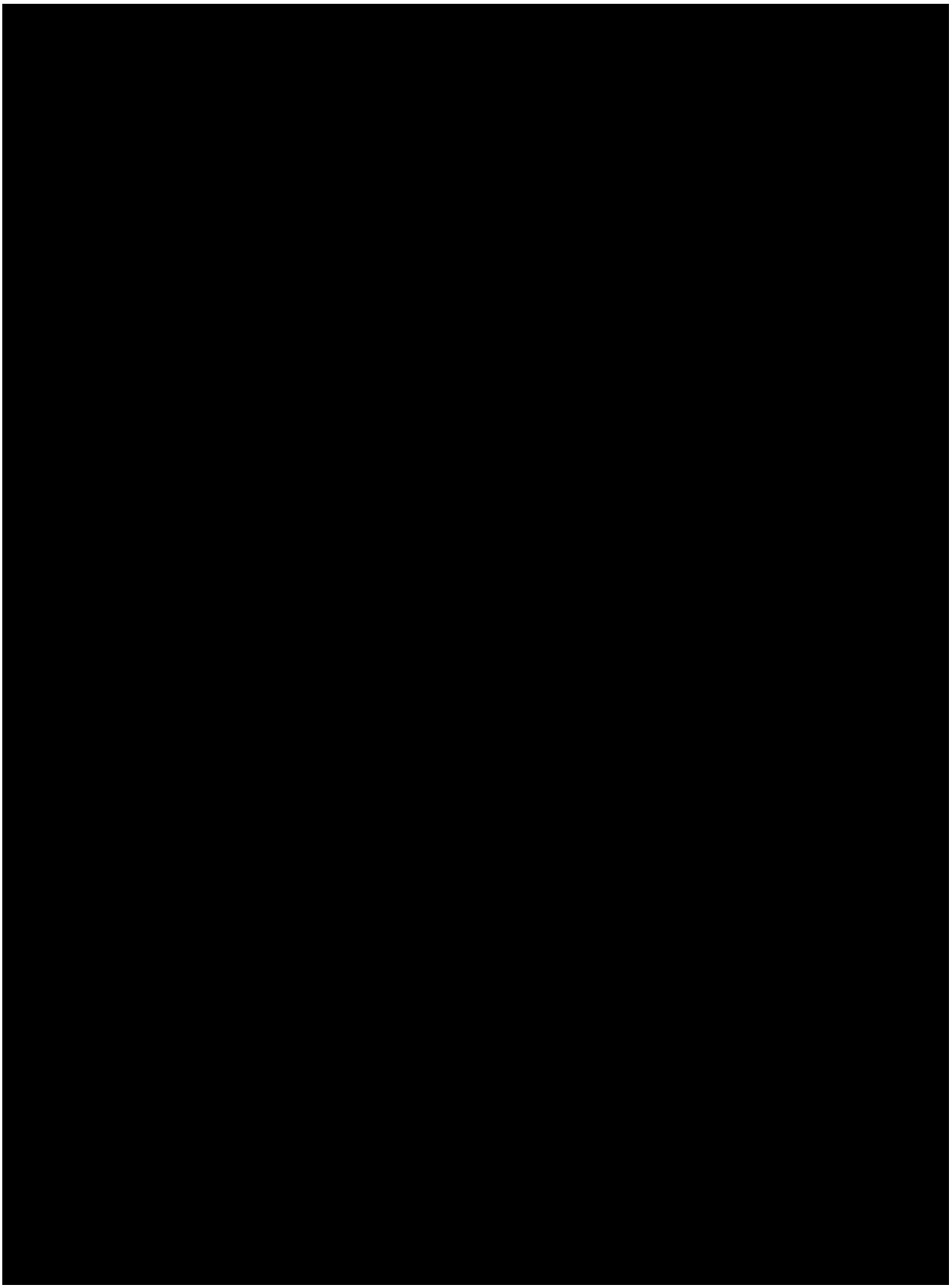
Regular Members - Principles or employees of Member Firms who rely on consultation in soil science for the majority of their earned income. All Regular Members have voting privileges.

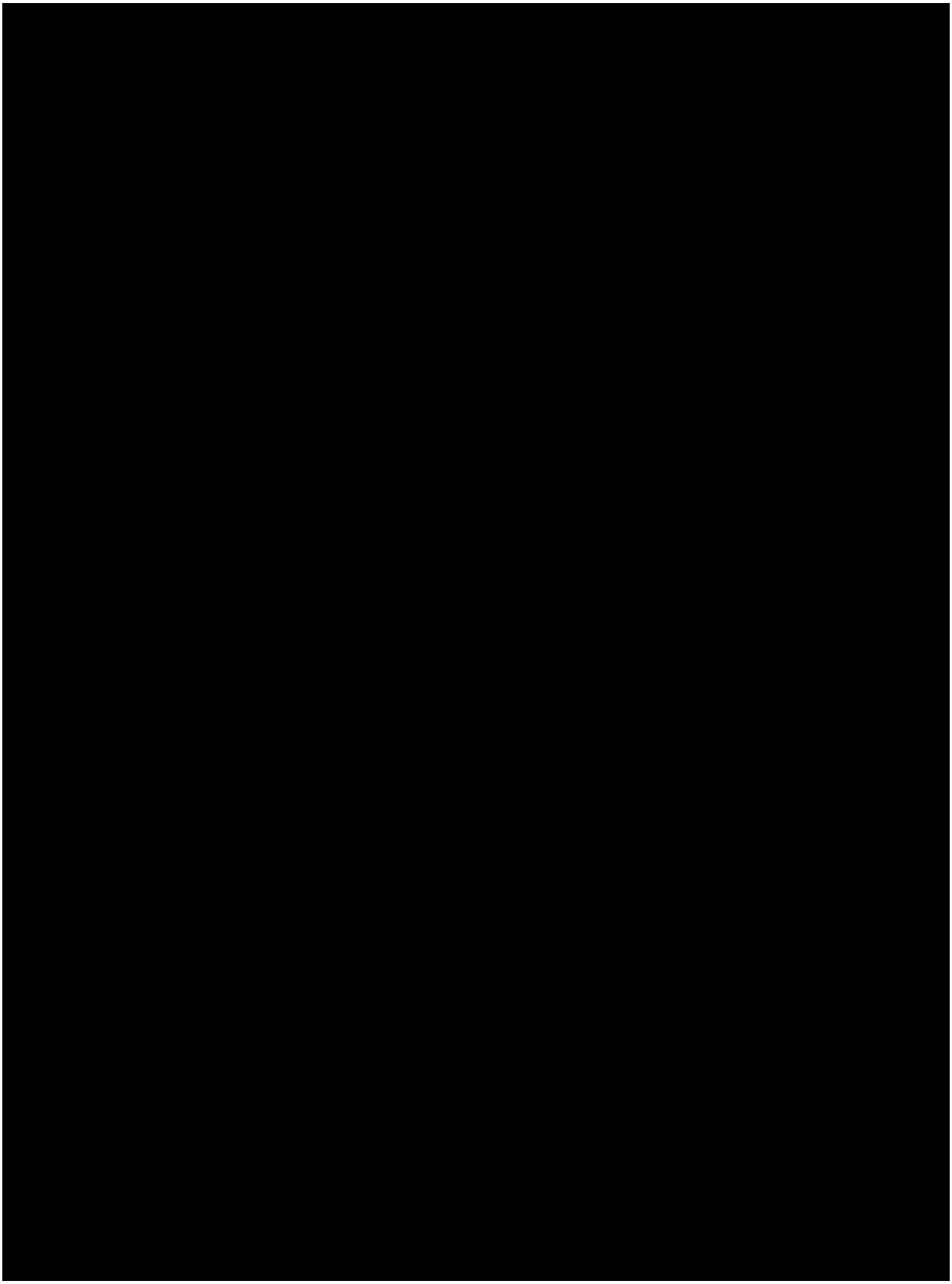
Associate Members - Individual Consulting Soil Scientists who are not employed by Member Finns, but who practice soil science consulting on a limited basis (non-voting member).

Affiliate Members - Any individual who does not qualify for Regular Member or Associate Member status, but who wishes to support the goals of the NSCSS (non-voting member).

For more information contact.

NATIONAL SOCIETY OF
CONSULTING SOIL SCIENTISTS, INC.
325 Pennsylvania Avenue, S.E., Suite 700





Natural Resources Conservation Service
United States Department of Agriculture

Louisiana State University
104 M. B. Sturgis Hall Baton Rouge, LA 70803-2110
voice: 504-388-1337 fax: 504-388-1403

March 18, 1998

KENNETH SCHEFFE
USDA - NRCS
6200 JEFFERSON, NE SUITE 305
ALBUQUERQUE, NM 87109

Attached are a hard copy of my Wetland Science Institute talk and a short biographical sketch of myself. Also attached is a copy of the slides to be used in the National Technical Committee for Hydric; Soils session.

The Institute talk and biographical sketch are on the computer disk.

Russ Pringle
Soil Scientist
NRCS - WLI

Talk given by Russ Pringle, Soil Scientist Wetland Science Institute to Western and Southern Regional Soil Survey Work Planning Conferences.

Good afternoon.
I welcome this opportunity to give you an update on the Wetland Science Institute.

To refresh your memory there are six members in the Institute:
Dr. Billy Teels, Director,
Dr. Norm Melvin, Plant Ecologist,
Leander Brown, Wetland Scientist. All located in Laurel, MD at the USGS Patuxent Wildlife Research Center.
Paul Rodrigue, Wetland Hydrologist, Oxford, MS at the USDA - ARS National Sedimentation Laboratory, University of Mississippi.
Michael Whited, Wetland Scientist, Lincoln, NE at the Forest Service Agro-Forestry Center, University of Nebraska.
Russ Pringle, Wetland Soil Scientist at the Department of Agronomy, Louisiana State University at Baton Rouge, LA.

Mission:

The mission of the Wetland Science Institute (WLI) is to proactively develop, adopt, and disseminate science and technology needed to protect and restore wetlands.

WLI Technology Focus Areas:

The WLI has aligned its technology focus areas with the kinds of wetland related activities normally carried out by NRCS field offices.

Applied Scientific Techniques for making accurate and highly defensible wetland delineations.

Adapt and disseminate emerging technology for restoring, enhancing, creating, and managing wetlands.

Develop scientific methods for assessment of wetland function and health.

Wetland planning and analysis technologies at watershed, regional, and national scales.

Provide specialized training in rapidly evolving wetland science.

Major Projects and Anticipated Products:

Field Testing of Wetland Health Indicators - In cooperation with partners, test a variety of ecological indicators and protocols that NRCS will use in the future to monitor trends in wetland health on a site specific, watershed, regional or nationwide scale.

Publications --

Field Indicators of Hydric Soils in the United States, second printing
Hydrology Tools,
Regional Wetland floras,
HGM Functional Assessment Guidebook for Prairie Potholes,
National Guidebook for HGM Assessment of Depressional Wetlands,
Practice Standards for Wetland Restoration and Enhancement,
Hydric Soils Interactive CD-ROM.

Wetland Information and Technology Reference Series - A series of technical guidance documents on wetland restoration, assessment, and delineation techniques.

Decision Support Systems for Wetland Restoration - Data-based GIS and computer simulation models for determining effective wetland landscape placement for making best use of wetland restoration program dollars.

Wetland Hydrology, Soils and Plant Data Collection - Numerous on-going projects to provide scientific credibility for the delineation of wetlands.

Training - Wedand Restoration, Advanced Hydric Soils, Hydric Soils for Conservationists, Hydrology Tools, HGM Functional Assessment, Wetland Plant Identification.

On-going Projects:

1. Evaluate New England hydric soil indicators - New Hampshire. NRCS, EPA, and COE.

2. Develop and refine hydric soil indicators in the Gulf Coastal. Plain - Alabama, Florida, and Mississippi. Dr. Stephen Faulkner, Louisiana State University.

3. Develop hydric soil indicators for organic soils of the coastal mid-Atlantic region. Dr. Martin Rabenhorst, Univ. of Maryland.

4. Study to improve procedure for characterizing soil temperature in mid-South region. Louisiana and Mississippi. Dr. Wayne Hudnall, Louisiana State University.

5. Develop hydric soil field indicators for western playas - Oregon. Dr. Herb Huddleston, Oregon State University.

6. Monitor hydrology/redox for Calciaquolls in North and South Dakota.

7. Develop a hydric soil standard. Develop a scientific functional standard for hydric soils that will be used to validate new hydric soil indicators and to determine hydric soil status of soils which are

controversial. Draft standard expected to be released in October 1998. NTCHS Technical Subcommittee - Dr. Stephen Faulkner, Louisiana State University, Chair.

8. Examine redoximorphic features in problematic prairie soils along east Texas gulf coast. NRCS, EPA, COE, Texas A&M University, Prairie View A&M University, Louisiana State University, and US Fish and Wildlife Service.

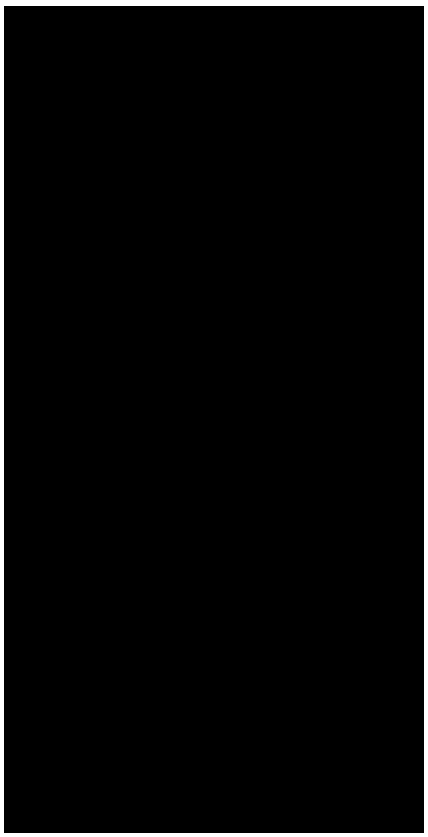
Along with these soil projects the Institute is also involved with hydrology and vegetation projects.

We are soliciting project proposals at any time. We can't promise you anything, but if we don't hear from you we can't help you.

National Cooperative Soil Survey

Western Regional Conference

June 14-19,1998



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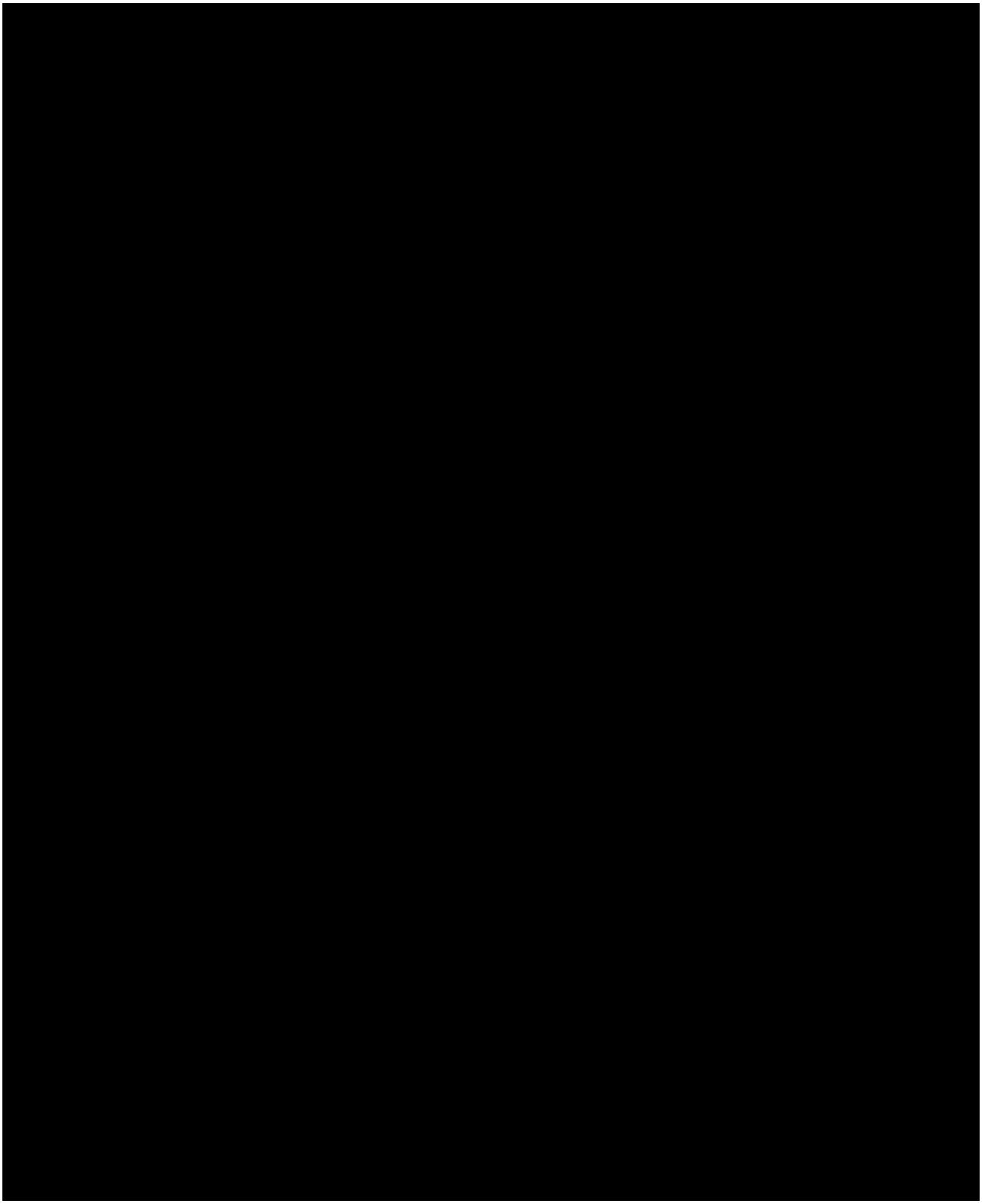

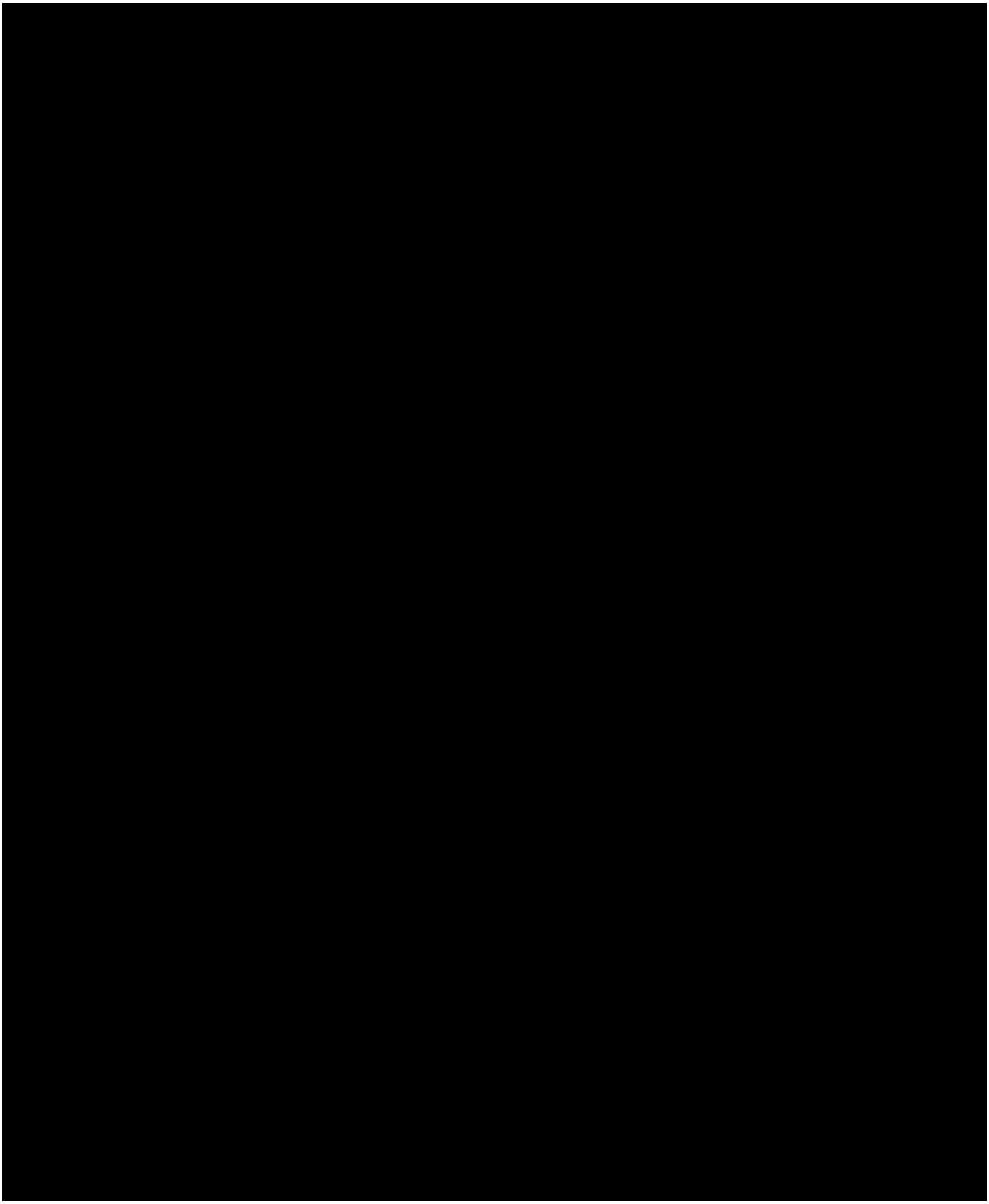

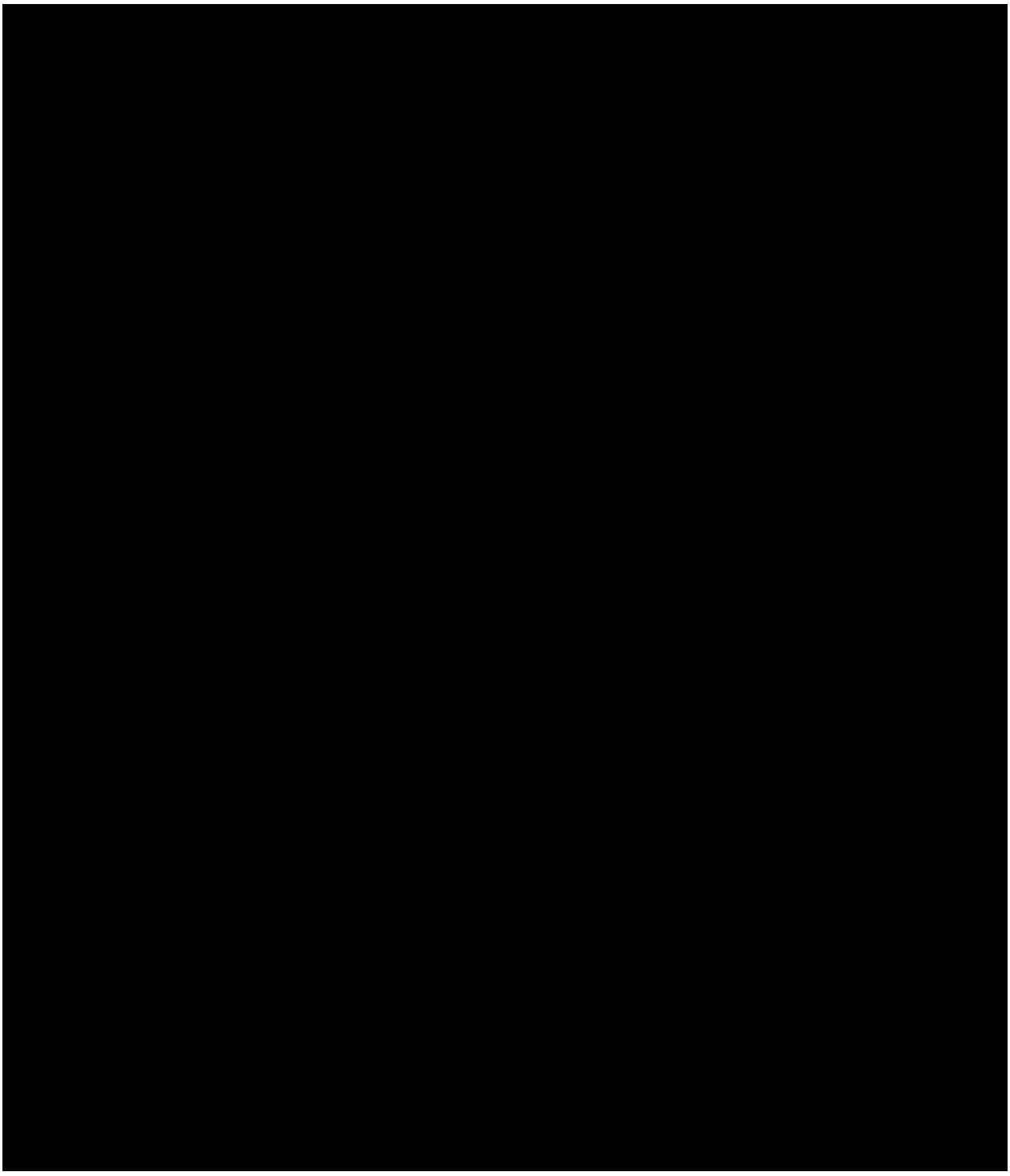

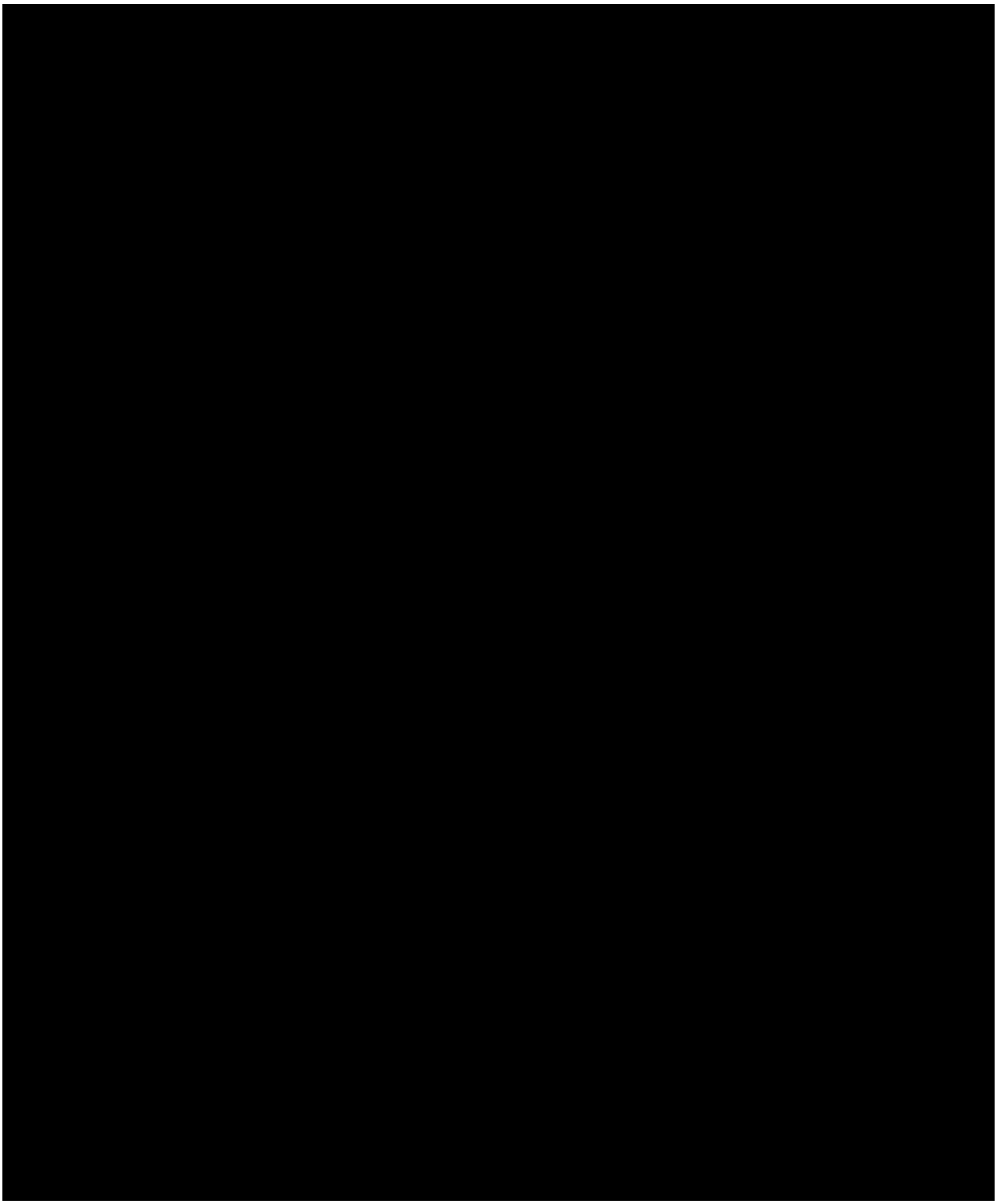

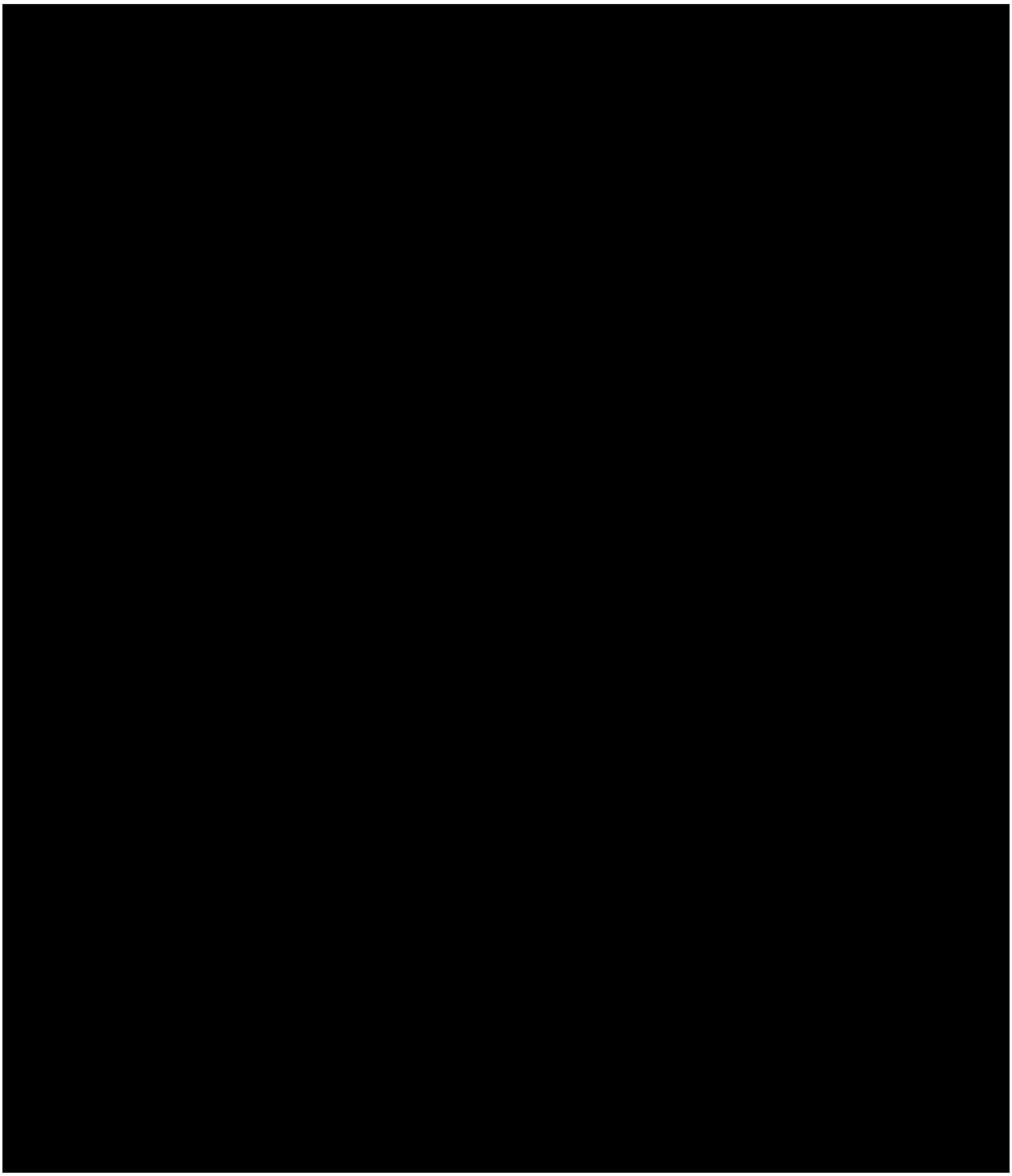

National Cooperative Soil Survey

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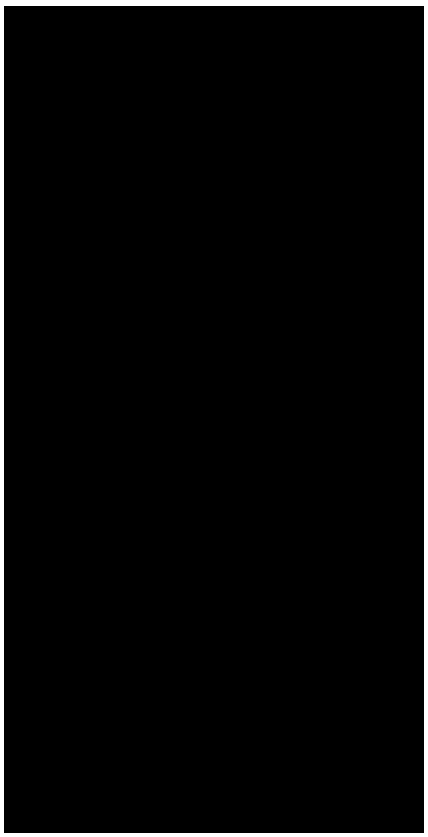


Committee Breakout Reports

Committee Breakout Topics and Charges

Group #1-- Research Needs Committee (Standing Committee)
Chair-- Dr. Curtis Monger, New Mexico State University -- (505) 646-1910
Charge 1 Identify current and recently completed research projects on soil survey.
Charge 2 Identify needed soil survey research activities in the West.

Group #2 -- Update of MLRAs and Land Resource Units (LRU) and Ecological Units for Ecosystem Characterization and Conservation Planning.
Chair-- Steve Park, NRCS, Lakewood, CO -- (303) 236-2910 ext. 231
Charge 1 Outline considerations in updating both lines and concepts.
Charge 2 Investigate and report on current updating efforts.

Group #3-- Soil Taxonomy Committee
Chair-- Bob Engel, NRCS, Lincoln, NE -- (402) 437-5323
Charge 1 Is there a need for a Standing Soil Taxonomy Committee in the NCSS West Region? Recommendations.
Charge 2 Identify needed modifications/changes/additions to Soil Taxonomy.

Group #4-- Soil Quality Information Products
Chair-- Tim Sullivan, USFS, Lakewood, CO
Charge 1 Catalog existing soil quality informational products
Charge 2 Recommend additional information product development, etc.

Group #5-- Technology Applications to Enhance Soil Survey
Chair-- Darrell Schroder, NRCS, Casper, WY (307) 261-6491
Charge 1 Inventory and catalog existing technology applications used in soil survey
Charge 2 Evaluation and assessment of suitability and use (with recommendations).

If you have interest in serving on one of these committees or have information you wish to contribute, please contact the chairperson.

Research Needs Committee

Chair: Curtis Monger
June 19,1998

Soil survey research needs, as identified by various agency and university participants, are listed below in the form of scientific questions.

Landscape-level understanding

What are t he eco-geo-hydro-climo-chrono-pedologic relationships at various scales?

How do soil patterns fit into the geomorphic context of the landscape?

What are the major soil-geomorphic properties important for understanding vegetation patterns (especially weeds)?

Remote sensing

What is the relationship between satellite images and soil properties?

How do these relationships change with time and at different scales?

Dynamic soil priorities

How do soils change temporally with respect to, for example:
water
pH
$C0_2$
aggregate size

What is the magnitude of these changes daily, seasonally, and decadally?

Biological

What biological data (other then OC, C/N, root distribution, and vegetation type) can be added to the soil survey data base?

Other

How can "common ecological units" be tested and validated?

What are the indicators of ecological health? What data and assessments are needed to develop indicators?

What data are needed for the interpretation of ecological potentials and capabilities at the landscape, sub region, and regional scale?

What is the effect of fire on different soil types?

Can exchange programs be developed between universities and agencies to foster research (e.g., graduate studies and sabbatical visits)?

WESTERN REGIONAL NCSS CONFERENCE

Albuquerque, New Mexico

JUNE 1998

UPDATE OF MLRAS AND LAND RESOURCE UNITS AND
ECOLOGICAL UNITS FOR ECOSYSTEM CHARACTERIZATION AND
CONSERVATION PLANNING

COMMITTEE MEMBERS:

Chair-- Steve Park, NRCS, Soil Data Quality Specialist, Lakewood, CO

Steve Wangemann, BIA, Supervisory Soil Scientist, Gallup
Berman Hudson, NRCS, Soil Scientist, Washington, DC
Chad McGrath, NRCS, MLRA Leader, Portland, OR
Jerry Freeouf, USFS, Regional Soil Scientist, Lakewood, CO
Jimmy Keys, USFS, Regional Soil Scientist; Atlanta, GA
Jeff Redders, USFS, Forest Soil Scientist, Durango, CO

COMMITTEE CHARGES:

Charge 1--Outline considerations In updating both lines and concepts.
Charge 2----investigate and report on current updating efforts.

UPDATE OF MLRAS AND LAND RESOURCE UNITS AND ECOLOGICAL UNITS FOR ECOSYSTEM CHARACTERIZATION AND CONSERVATION PLANNING

Committee Members Responses
to Committee Charges

Chad McGrath, NRCS, MLRA Leader, Portland, OR

It is extremely important that we try our best to make our MLRA and LRR lines come as close as possible to coinciding with Ecoregion lines. In today's world we must be able to transcend administrative boundaries with our scientific information if we are to be able to maintain any credibility with the public.

Physical characteristics used for ecoregion mapping include climate, geology, geomorphology, historical and present day vegetation, soil, land use, and hydrology. These factors are studied to determine the ecosystem character. LRR's and MLRA's represent nearly homogeneous areas of soil, climate, land use, water resources, elevation, topography, and potential natural vegetation. In reviewing the criteria and characteristics used to define ecoregions and LRR's or MLRA`s, there is commonality in that they both consider climate, land use, soil, hydrology or water resources, and vegetation. There is some difference in the way the two systems look at vegetation as the MLRA looks at potential natural plant community and ecoregion looks at present or historic vegetation. Still it appears that we should be able to come to agreement on the placement of lines at some level of the hierarchy.

It is my opinion that islands of different MLRA's or subsections should be recognized within a larger MLRA or subsection. I think a good example of recognizing and island would be to recognize the Black Hills of South Dakota as an island of the Rocky Mountains rather than including it as a part of the Great Plains.

In the Pacific Northwest Soil Survey Region we are just beginning to do soil survey update and maintenance by MLRA. As a part of this work we are evaluating the MLRA boundaries. It is our intent to adjust these boundaries by starting with the detailed soil survey and aggregating them to form the STATSGO map units. We will then aggregate the STATSGO units to develop the Common Resource or Land Resource Units. These will then be aggregated to develop a first cut of any proposed adjustment that may need to be made to MLRA lines.

As we complete more and more of our soil surveys and ecological unit inventories, especially in the West, it will provide us with the information and data necessary for revising and updating MLRAs.

Steve Park, NRCS, Soil Data Quality Specialist, Lakewood, CO

The NCSS has embarked into the realm of conducting soil surveys on an MLRA basis. The NRCS is also emphasizing conservation planning on a resource base independent of county, state, and other political boundaries. Thus, it is imperative that we make our MLRAs, and LRRs, more ecologically based. Many of the existing MLRAs are based more on social and cultural aspects than on ecology. In addition, the definitions and concepts of many MLRAs overlap, and thus are not easily distinguished from one another.

I am confident that if the different agencies involved employed common criteria and scale in the development of MLRAs and Ecoregions, that many common lines would exist. Looking at the current criteria and lines of the different agency maps, I feel we have more in common than we have differences.

I feel the following issues need to be addressed before each MLRA Office (MO) embarks on revising and updating MLRAs:

1. A new revised NRCS national policy, concerning the update of MLRAs and Ecoregions, needs to be drafted and released. Part 649 of the NSSH should be revised to accommodate the new policy. This will ensure unified national direction and consistency among the 17 different MOs in the revision, or clarification, of MLRAs. Currently, the 17 MOs are operating independently of each other.
2. The scale for the national MLRA map of 1:7,500,000 should be changed to 1:3,500,000. The NSSH states that MLRAs are most useful at the state level. However, at the current scale of 1:7,500,000 many significant ecological units (at the state level) can not be delineated because they do no meet the minimum size requirements of a 1:7,500,000 scale.
3. Common criteria should be used to develop, or revise, MLRA definitions and concepts. If needed, Part 649 of the NSSH should be revised to reflect the common criteria.
4. Land Resource Units (LRUs-building units for MLRAs) should be unique to their respective MLRA and not to states. The NSSH currently states that LRUs are state determined, and as such can not be correlated across state lines. Part 649 of the NSSH should be revised to make LRUs unique to MLRAs and not to states.
5. Clarification from the National Office is needed on the relationship of Common Resource Areas (CRAs) and LRUs. Are they, or can they be, one and the same? Are both needed? Should the definition and role of the CRA be included in part 649 of the NSSH?
6. The "island" concept for delineation of MLRAs (or section) should be supported. This concept allows delineations of inclusions of a different MLRA to exist within a much larger delineation of a contrasting MLRA.
7. The "aggregating up" philosophy for determining MLRA (or section) lines should be supported. This philosophy involves evaluating the properties and attributes of the soil (ecological) map unit to determine which MLRA-LRU best fits. The soil (ecological) map unit is then labeled with the appropriate MLRA-LRU designation. The map units, at the SSURGO level, are then aggregated into STATSGO. STATSGO is then aggregated into a national map. This process ensures that SSURGO level map units are properly labeled and are not compromised by the top down approach.

As far as update efforts are concerned, M06 has been working with M08, and others, in revising and realigning MLRAs 34, 35, 36, 37, and 39 as used on the Colorado Plateau. This work has resulted in two proposals which are currently under review.

Jeff Redders, USFS, Forest Soil Scientist/Ecologist, Durango, CO

Update of NRCS MLRAs and LRUs, and FS Ecological Units

CHARGE 1 -- Considerations in updating lines and concepts.

-- The NRCS and the Forest Service (FS) should work together and agree on 1 set of lines which best represent ecological units at the various broad scales we're interested in. Currently with regard to scale, NRCS Land Resource Regions best correlate to FS Divisions and Provinces, NRCS MLRAs best correlate to FS Sections, and NRCS LRUs best correlate to FS Subsections. Major differences exist between existing NRCS Regions and FS Divisions/Provinces. In order for us to make sense of and determine where the lines should be at the MLRA-Section scale, we first need to make sense of and determine where the lines should be at the Region-Division/Province scale. This is a top down approach as opposed to an aggregation up of finer ecological units.

-- Criteria used to define broad scale ecological units have already been adequately described (SCS Ag Handbook 296, FS Ecol. Subregions of the US, FS Misc. Pub. 1391). NRCS, describes criteria for Regions and MLRAs by the following dominant physical characteristics; land use, elevation and topography, climate, water, soils, and potential natural vegetation (PNV). FS describes criteria for Divisions, Provinces, and Sections by the following environmental factors; geomorphology, geology, soils, PNV, and climate. There is some common ground here, as both agencies rely heavily on the ecological components of climate, topography (geomorphology), soils, and PNV. These are the key factors, while the others are less important at these scales. Climate and topography are the key delineation criteria. Soils and PNV are a reflection of climate and topography and can be used to help make the ecological unit breaks, but on their own they generally aren't key delineation criteria at these scales. Geology is a good delineation criteria at the LRU-Subsection level and below, but even though there usually is a good correlation between geology and topography, geology is generally not a key delineation criteria at the MLRA-Section level and above.

-- All ecological units will have inclusions or 1slands" of smaller units within them. At the scales we're dealing with here, there are going to be some significant inclusions that represent some large and important pieces of ground. We should recognize that but not get too hung up on it.

-- Proposed changes to existing lines (Land Resource Regions, MLRAs, LRUs, Divisions, Provinces, Sections, Subsection) should be made by a team of interagency people, and sent out for peer review. All existing lines and information should be pulled together and reviewed. Rational for existing lines should be presented, explained, and understood as best we can. Existing lines need to be displayed on relief or contour maps with enough cultural features to tell where those lines really are. There are many maps with lines out there, but none of them that I have seen, are detailed enough to tell you where those lines really are relative to the ground.

CHARGE 2 -- Current Updating Efforts.

-- Jeff Redders, ecologist with FS, has been working on Section and Subsection lines in the 4-Corners Area. His subsections are primarily based on topography (landform features) and geology.

References

SCS Ag Handbook 296, Land Resource Regions and Major Land Resource Areas of the US, 1981.
Forest Service WO--WSA--5, Ecological Subregions of the US, McNab and Avers, 1994
Forest Service Miscellaneous Publication #1391, Description of the Ecoregions of the US, Robert Bailey, 1995.

Steve Wangemann, BIA, Supervisory Soil Scientist, Gallup, NIVI

The USDA currently uses Land Resource Regions (LRR), Major Land Resource Areas(MLRA), and Land Resource Units (LRU). My feeling is that these delineated areas do not form a consistent picture of the Nation based on the fact that cropping patterns carry too much weight in some regions and not enough weight in others. This is understandable considering the source and purpose of their development. For example LRR-W, Southern Alaska Region as compared to the LLR-L, Lake States Fruit, Truck, and Dairy Region.

I would like the committee to consider the position that Ecoregions should provide us with the first level of separation comparable to the current LRR. At a scale of 1:3,500,000 provisions could be made to show transition zones as well. The EROS-AFO Alaska Ecoregion Map is provided as an example.

The intent of further subdivisions could be to serve the needs of participating agencies. The strongest argument that I can see for the use of ecoregions rests in the fact further subdivisions, however interpreted by the participating agencies, all reside within a common thread (the ecoregion). Within soil survey we have never examined the biodiversity of an area in enough detail to grasp all the significant differences between regions. Consequently we have created too much overlap and confusion leading to the incorrect assignment of soil series over too broad a range in ecological conditions. In most cases we interpret the morphology correctly but do not always do justice to the associated interpretations. If Ecoregions are adequately separated, and provided they sufficiently correlate with changing degrees in the soil formation state factors, they could form the primary basis of series criteria. When overlapping a series into another Ecoregion it would be understood that the soil delineation is an island outside the primary Ecoregion of origin (type location) and that some Ecoregions have similar subunits within them. Similar, meaning that interpretations must be the same.

In addition the numbering system of the ecoregions and subsequent subdivisions could be controlled in a manner similar to the watershed numbering system. Subunits of similar character from one Ecoregion to another could carry the same secondary digits, the primary digits being the Ecoregion number code. Subsequent digits or attribute tables could be substituted for but not limited to differences in yield, growing season, dominant crop use, other crop risk factors, and /or dominant land use.

I believe that our committee should do everything possible to develop consistency between agencies in how we partition the resource base. By doing that, all data collected from any source could be placed in the proper data base partition. That is not to say, as indicated, that crop data or land use specific needs could not be addressed at lower levels within the system.

This effort should never be regarded as a single use tool by any agency.

I think we should look at the work of:

Baily, Robert G., Peter E. Avers, Thomas King, Henry W. McNab, eds. 1994. Ecoregions and subregions of the United States (map). Washington, DC; U.S.Geological Survey. Scale 1:7,500,000; colored. Accompanied by a supplementary table of map unit descriptions compiled and edited by McNab, W. Henry and Bailey, Robert G. Prepared for the U.S. Department of Agriculture, Forest Service.

NAME (Optional):
TITLE:
AGENCY:

Please answer yes or no to the following questions. Feel free to add remarks.

1. Should there be only one ecological unit map used by the BIA, BLM, EPA, NPS, NRCS, and USFS?

2. Should each agency use their own maps, but employ common ecological unit criteria to ensure that coincident lines exist between the different agency maps?

3. Should common ecological criteria be developed that can be used by all agencies?

4. Following is a list of potential common criteria that might be used to evaluate and define different ecological zones whether they be MLRAs or Ecoregions. This list may also be applied at the lower hierarchical levels such as Land Resource Units (LRUs) and subsections. Please indicate whether the criteria should (yes) or should not (no) be used. Please add any other criteria you may find useful

	YES	**NO**
Geomorphology		
Geomorphic Province	_____	_____
Geology	_____	_____
Landform	_____	_____
Elevation	_____	_____
Climate		
Range of Avg. Annual Precipitation	_____	_____
Range of Avg. Annual Snowpack	_____	_____
Distribution of Precipitation	_____	_____
Range of Avg. Annual Temperature	_____	_____
Freeze-Free Period	_____	_____
Soils		
Soil Temperature Regime	_____	_____
Soil Moisture Regime	_____	_____
Dominant Great Groups	_____	_____
Dominant Soil Series	_____	_____
Vegetation		
Potential Natural Vegetation	_____	_____
Present Vegetation	_____	_____
Dominant Veg Cover Type	_____	_____
Key Species	_____	_____
Fauna	_____	_____
Water Resources		
Surface Water	_____	_____
Ground Water	_____	_____
Watershed Identification	_____	_____
Disturbance Regimes	_____	_____
Cultural Ecology	_____	_____
Crops and Cropping Practices	_____	_____
Land Use	_____	_____

5. Is the current national MLRA map scale of 1:7.5 million suitable for displaying ecological areas?

6. Should the current national map scale for MLRAs be changed to 1:3.5 million?

7. Do you support the concept of allowing delineations of "islands", or "inclusions", of a different MLRA within a much larger delineation of a contrasting MLRA?

8. Should the MLRA designation be considered series criteria for separating different soil series?

9. If MLRA descriptions and concepts were more narrowly defined, so that they did not overlap with other MLRAs, could they then be considered as series criteria?

10. According to part 649 of the National Soil Survey Handbook (NSSH), LRUs are specific to states and are displayed only on state maps. However, the NSSH also states that LRUs define MLRAs. Should the NSSH be revised to allow LRUs to be unique to MLRAs, and as such be correlated across state lines?

11. Currently a data element identifying the LRU does not exist in NASIS or the Soil Classification Databases. Would you favor a data element be added in NASIS and in the Soil Classification Databases for identifying the LRU?

12. Would you favor adding data elements in NASIS for province, section, and subsection?

13. Some Regional NRCS efforts have utilized Common Resource Areas (CRAs) to revise MLRA maps. Do you understand the relationship between CRAs and LRUs?

14. Should part 649 of the NSSH be revised to address the relationship between CRAs and LRUs?

15. Do we need to have both CRAs and LRUs?

16. With the reorganization of the NRCS, Soil Survey Program, the responsibility for MLRAs has been given to the MILRA Offices (MOs). Should the 17 different MOs be "empowered" to revise and update MLRAs using their own unique criteria and procedures?

17. Should the MOs be provided with a revised national policy that outlines criteria and procedures for revising and updating MLRAs?

18. Do you favor a "top" down approach to determine the concepts and line placement for MLRAs, Sections, etc.?

19. Do you favor the "bottom" up approach (aggregating up) to determine the concepts and line placement for MLRAs, Sections, etc.?

20. Do you think Ken Scheffe will make it through the week?

UPDATE OF MLRAS AND LAND RESOURCE UNITS AND ECOLOGICAL UNITS FOR ECOSYSTEM CHARACTERIZATION AND CONSERVATION PLANNING

SUMMARY OF QUESTIONNAIRE RESPONSES

1. Should there be only one ecological unit map used by the BIA, BLM, EPA, NPS, NRCS, and USFS?

YES: 41%
NO: 47%
DON'T KNOW/DID NOT ANSWER: 12%

COMMENTS: Questions 1, 2, and 3 deal with the development of ecological maps and criteria used by different agencies. Most (47%) felt that only one ecological unit map used by the different agencies was not needed. However, many of the written comments stated an advantage to using only one map. The majority (59%) favored using common criteria (100% to question 3) to develop ecological maps with coincident lines.

2. Should each agency use their own maps, but employ common ecological unit criteria to ensure that coincident lines exist between the different agency maps?

YES: 59%
NO: 29%
DON'T KNOW/DID NOT ANSWER: 12%

3. Should common ecological criteria be developed that can be used by all agencies?

YES: 100%
NO:
DON'T KNOW/DID NOT ANSWER:

4. Following is a list of potential common criteria that might be used to evaluate' and define different ecological zones whether they be MLRAs or Ecoregions. This list may also be applied at the lower hierarchical levels such as Land Resource Units (LRUs) and subsections. Please indicate whether the criteria should (yes) or should not (no) be used. Please add any other criteria you may find useful

	YES %	NO %
Geomorphology		
Geomorphic Province	94	6
Geology	88	12
Landform	94	6
Elevation	94	
Climate		
Range of Avg. Annual Precipitation	94	6
Range of Avg. Annual Snowpack	88	12
Distribution of Precipitation	94	6
Range of Avg. Annual Temperature	88	12
Freeze--Free Period	88	12
Soils		
Soil Temperature Regime	100	
Soil Moisture Regime	100	
Dominant Great Groups	100	
Dominant Soil Series	76	24

Vegetation		
Potential Natural Vegetation	94	6
Present Vegetation	76	24
Dominant Veg Cover Type	88	12
Key Species	94	6
Fauna	76	24
Water Resources		
Surface Water	82	18
Ground Water	70	30
Watershed Identification	76	24
Disturbance Regimes	70	30
Cultural Ecology	70	30
Crops and Cropping Practices	76	24
Land Use	82	18

COMMENTS: All the respondents replied, that depending on the scale and what level of the hierarchy was used, the above criteria could be used. Dominant soil series, present vegetation, fauna, ground water, watershed identification, disturbance regimes, cultural ecology, and crops and cropping practices received more negative responses than the other criteria. Many of the written comments received thought fauna, water resources, disturbance regimes, cultural ecology, crops, and land use should only be used at the LRU level.

5. Is the current national MLRA map scale of 1:7.5 million suitable for displaying ecological areas?

YES: 59%
NO: 29%
DON'T KNOW/DID NOT ANSWER: 12%

COMMENTS: Most of the respondents replied the national scale of 1:7.5 million was suitable. However, the majority of the respondents who replied "yesr, also indicated this scale (1:7.5 million) was best suited for broad national planning purposes. This, combined with the findings from question 6, might indicate that using a scale of 1:7.5 million to identify MLRAs at the state level may not be appropriate.

6. Should the current national map scale for MLRAs be changed to 1:3.5 million?

YES: 35%
NO: 24%
DON'T KNOW/DID NOT ANSWER: 41%

7. Do you support the concept of allowing delineations of 'islands", or "inclusions", of a different MLRA within a much larger delineation of a contrasting MLRA?

YES: 82%
NO: 12%
DON'T KNOW/DID NOT ANSWER: 6%

COMMENTS: An 82% majority favored the "island" or"inclusionn concept to guide the labeling of MLRA delineations. This is opposite of what has happened in the past where these "islands" or "inclusions" were given the MLRA label of the larger surrounding MLRA.

8. Should the MLRA designation be considered series criteria for separating different soil series?

YES: 47%
NO: 53%
DON'T KNOW/DID NOT ANSWER:

COMMENTS: Questions 8 and 9 deal with the issue of using the MLRA designation as soil series criteria. A slight majority (6%) stated that the MLRA designation should not be used for series criteria. However, the respondents were evenly split when answering question 9.

9. If MLRA descriptions and concepts were more narrowly defined, so that they did not overlap with other MLRAs, could they then be considered as sedes criteria?
YES: 47%
NO: 47%
DON'T KNOW/DID NOT ANSWER: 6%

10. According to part 649 of the National Soil Survey Handbook (NSSH), LRUs are specific to states and are displayed only on state maps. However, the NSSH also states that LRUs define MLRAs. Should the NSSH be revised to allow LRUs to be unique to MLRAs, and as such be correlated across state lines?
YES: 65%
NO: 12%
DON'T KNOW/DID NOT ANSWER: 24%

11. Currently a data element identifying the LRU does not exist in NASIS or the Soil Classification Databases. Would you favor a data element be added in NASIS and in the Soil Classification Databases for identifying the LRU?
YES: 53%
NO: 35%
DON'T KNOW/DID NOT ANSWER: 12%

12. Would you favor adding data elements in NASIS for province, section, and subsection?
YES: 65%
NO: 29%
DON'T KNOW/DID NOT ANSWER: 6%

13. Some Regional NRCS efforts have utilized Common Resource Areas (CRAs) to revise MLRA maps. Do you understand the relationship between CRAs and LRUs?
YES: 29%
NO: 53%
DON'T KNOW/DID NOT ANSWER: 18%

COMMENTS: Questions 13,14, and 15 deal with CRAs and LRUs. It is obvious from the responses that the definition, concept and use of CRAs and LRUs is not known or understood by a majority (71 %) of the respondents. The majority of the written comments received stated that CRAs and LRUs were essentially the same and that both should not be used.

14. Should part 649 of the NSSH be revised to address the relationship between CRAs and LRUs?

YES: 35%
NO: 12%
DON'T KNOW/DID NOT ANSWER: 53%

15. Do we need to have both CRAs and LRUs?

YES: 12%
NO: 41 %
DON'T KNOW/DID NOT ANSWER: 47%

16. With the reorganization of the NRCS Soil Survey Program, the responsibility for MLRAs has been given to the MLRA Offices (MOs). Should the 17 different MOs be "empowered" to revise and update MLRAs using their own unique criteria and procedures?

YES: 6%
NO: 94%
DON'T KNOW/DID NOT ANSWER:

COMMENTS: An overwhelming majority (94%) of the respondents did not want the MOs to use their own unique criteria and procedures for revising and updating MLRAs. However, the majority of the written comments suggested that the MOs should coordinate with the national office to draft a revised national policy to ensure consistency across the nation. A majority (76%) felt that a revised national policy was needed (see question 17).

17. Should the MOs be provided with a revised national policy that outlines criteria and procedures for revising and updating MLRAs?

YES: 76%
NO: 12%
DON'T KNOW/DID NOT ANSWER: 12%

18. Do you favor a "top" down approach to determine the concepts and line placement for MLRAs, Sections, etc.?

YES: 24%
NO: 65%
DON'T KNOW/DID NOT ANSWER: 11%

COMMENTS: Questions 18 and 19 deal with the philosophy of a "top" down or a "bottom" up approach for MLRAs. Even though the majority favored a "bottom" up approach, most of the written comments suggested that both needed to happen at the same time to ensure a quality product. Some comments received are: "Guidance and framework should be 'lop" down"; "Exact line placement should be bottom up and adjusted to scale"; and "There needs to be a national perspective modified by local input."

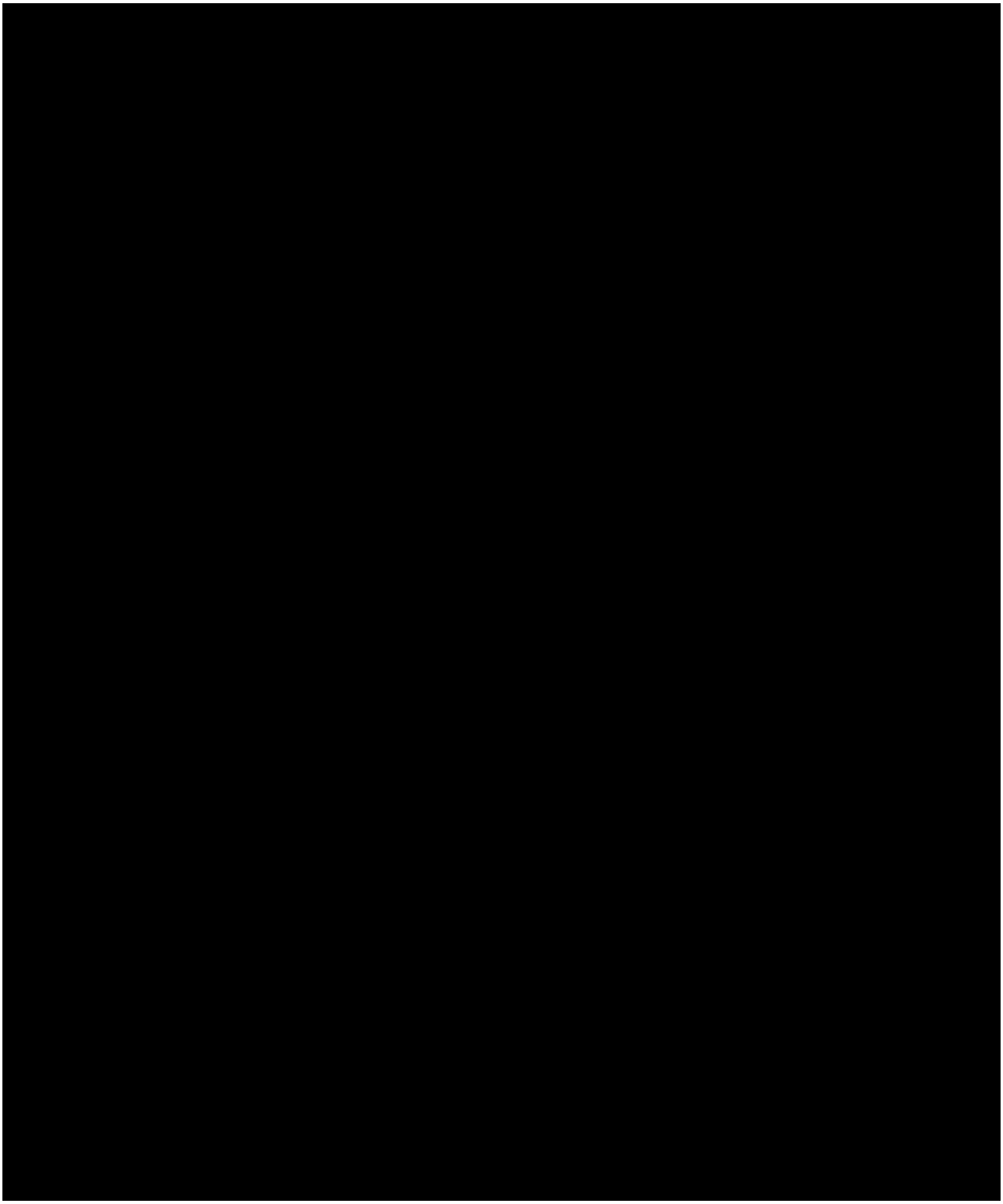
19. Do you favor the "bottom" up approach (aggregating up) to determine the concepts and line placement for MLRAs, Sections, etc.?

YES: 82%
NO: 0%
DON'T KNOW/DID NOT ANSWER: 18%

UPDATE OF MLRAS AND LAND RESOURCE UNITS AND ECOLOGICAL

UNITS FOR ECOSYSTEM CHARACTERIZATION AND CONSERVATION PLANNING

POWERPOINT PRESENTATION



Soil Taxonomy Committee

Charge 1: Is there a need for a standing Soil Taxonomy committee in the NCSS West Region?

We discussed the possible functions of the committee. Hayes Dye then suggested that we recommend the reestablishment of the Soil Taxonomy committee at the business meeting.

Discussion followed on the operation of the committee. It was recommended that the committee review proposed changes to Soil Taxonomy submitted to the Lead Scientist for Soil Taxonomy. The committee will not review proposals prior to submission to the Lead Scientist for Soil Taxonomy

Charge 2: Identify needed modifications/changes/additions to Soil Taxonomy.

Discussion followed on the problem of the ustic moisture regime not being recognized in the soils with a cryic temperature regime. The committee could develop recommendations and submit them to Dr. Ron Paetzold chair of the International Committee on Soil Moisture and Temperature Regimes.

Prepared by Bob Engel, Chair

COMMITTEE REPORT

SOIL QUALITY INFORMATION PRODUCTS

WESTERN REGIONAL NATIONAL COOPERATIVE SOIL SURVEY CONFERENCE
ALBUQUERQUE, NM -- JUNE 14-19,1998

Committee Members

Tim Sullivan, USFS -- Chairman
Al Amen, BLM
Kathy Seybold, NRCS
Willie Forest, BOR
Tom Collins, USFS
Kimberley Johnson, Intermountain Region, USFS
Arlene Tugel, Soil Quality Institute, NRCS
Bill Ypsilantis, BLM
Randy Southard, UCD

Objectives:

1. Catalog existing soil quality informational products.

2. Recommend additional informational product development.

CATALOG OF SOIL QUALITY INFORMATIONAL PRODUCTS

References

Acton, D.F., and Gregorich, L. J. (Editors) 1995. Agriculture and Agri-Food Canada Research Branch. The Health of Our Soils - Towards Sustainable Agriculture in Canada. Publication 1906/E

American Journal of Alternative Agriculture-Special Issue on Soil Quality: Volume 7, Number 1 & 2. 1992. Institute For Alternative Agriculture, Inc. 9200 Edmonston Road, Suite 117, Greenbelt, Maryland 20720

Center for Microbial Ecology, Michigan State University; **http://www.cme.msu.edu/CME/ED_OUT/ed.out.html**

Elliott, L. F., J.M. Lynch and R.I. Papendick. The Microbial Component of Soil Quality, 21 pages.

Halvorson, J.J., J.L. Smith, and R.I. Papendick. 1997. Issues of Scale for Evaluating Soil Quality. J. Soil and Water Cons 52:26-30.

Herrick, J., Seybold C., Harms, D, and Grossman, R. 1997. Workshop on Rangeland Soil Quality.

Illinois Soil Quality Institute, University of Illinois;
http://www.aces.uniuc.edu/~asap/isqi/isqi.htm

Kearney Foundation of Soil Science, University of California - The University of California's Kearney Foundation of Soil Science is supporting research on the Foundation's 1906--2001 mission "Soil Quality in the California Environment". Summary results of 18 separate research projects can be seen on the world wide web at **http://www.CNR.Berkeley.edu/~gsposito/Kearney/.** Research topics include:

1. The Relationship between Organic Matter and Soil age in the San Joaquin Valley of California.

2. Organic Matter Analysis by NMR and Carbon Isotope Techniques: Bridging the Gap between Soil Processes and Quality.

3. Surfactant and Gel Structures on Soil Minerals: Designing Soil Amendments for the Next Century.

4. NMR Relaxation of Soil Water: Process-based Evaluation of Porosity, Hydrologic Conductivity and Solute Sorptive Behavior of California Soils.

5. Microbial Diversity and Resilience of Agricultural Ecosystems: An Examination of the Diversity-Stability Hypothesis.

6. Defining Soil Quality in Terms of Microbial Community Structure.

7. Macrofaunal Influences on Chaparral Soil Quality.

8. Soil Quality Assessment in Irrigated Agriculture: Influence of Soil and Water Management on Physical Properties.

9. Defining Organic Matter Maintenance and Sustainable N Cycling through Changes in Stable Isotopes in Conventional and Low-input Systems.

10. Pulses of Microbial Activity after tillage: Implications for Soil Quality and Nitrogen loss.

11. Dissolved Organic Matter as a Characteristic Affecting the Role of Soil in Mitigating Pesticide Transport.

12. Trace Gas Emissions from Soil: Testing and Development of Process Models for Agricultural Regions.

13. Enzymatic Release of Nutrients form Organic Residues in Forests: An Index for Soil Organic Matter Quality.

14. Development of Indices of Microbial Community Structure for Soil Quality Assessment.

15. Effect of Growth Zones on Soil Quality in the Rhizosphere.

16. Processes of Aggregate Stability.

17. Evaluating Redox Status Utilizing TEAPs to Assess the Formation of H2S in Paddy Rice Soils with Incorporated Rice Straw.

18. Bulk and Rhizosphere pH as Indicators of Soil Quality: A comparison of Agriculturally-Acidified and Naturally-Occurring Acid Soils.

Pacific NW Forest & Rangeland Soil Organism Symposium proceedings. Hope to publish through USFS PNW Station by March 1999.

Preliminary discussions were initiated regarding the BLM cooperating with NRCS in development of phase 2 of the Soil Biology Primer. The BLM would provide management recommendations for rangeland.

Proceedings of the Soil Quality Standards Symposium, San Antonio, Texas, October, 23, 1990. At the 82nd Annual Meeting of the Soil Science Society of America, October 21-27, 1990.

Smith, J.L. 1994. Cycling of Nitrogen through Microbial Activity. *In* Soil Biology: Effects on Soil Quality (J.L. Hatfield and B.A. Stewart ed.'s).

Smith, J.L. and J.W. Doran. 1966. Measurement and Use of pH and Electrical Conductivity for Soil Quality Analysis. p. 169-185. *In* J.W. Doran and A.J. Jones (ed.) Methods for assessing soil quality soil quality. SSSA Spec. Publ. 49. SSSA, Madison, WI.

Smith, J.L., J.J. Halvorson and R.I. Papendick. 1993. Using Multiple-Variable Indicator Kriging for Evaluating Soil Quality. Soil Sci. Soc. Am. J. 57:743-749.

Soil Biological Communities web site and hard copy. This is a brief introduction to rangeland soil biological communities for BLM managers, natural resource field personnel, and user groups. It will be placed on the BLM internet site. Draft version of text is out for review at current time. Estimate it to be on web by end July or earlier.

Soil Quality Institute, NRCS; **http://www.statlab.iastate.edu:80/survey/SQI/sgihome.shtml**

Soil Quality Regional Technical Team, NRCS;
http://www.statiab.iastate.edu/survey/SQI/sqt/sgthomeshtml.

Staben, M.L., D.F. Bezdicek, J.L. Smith and M.F. Fauci. 1997. Assessment of Soil Quality in Conservation Reserve Program and Wheat-Fallow Soils. Soil Sci. Soc. Am. J. 61:124-130.

Tangway, David. Rangeland Soil Condition Assessment Manual. Division of wildlife and Ecology. CANBERRA CSIRO Australia.

Products

National Science & Technology Consortium Products. All of these products can be ordered free of charge from the web page **http://www.statiab.iastate.edu/survey/SQI/sqihome.shtml.**

1. Assessment of Soil Quality Workshop Presentation - This presentation discusses the assessment of soil quality at various levels of scale ranging from the farm or field level to the regional or national level. A review of the definition of soil quality is presented with a discussion on soil quality indicators, reference values and soil quality assessments. The presentation was made at the workshop on Long-term Research on Soil, Water, and Nutrient Management, Columbus, Ohio (July, 1996). It is available from the web site: http://www.statlab.iastate.edu/survey/SQI/sqihome.shtml.

2. Introduction to Microbiotic Crusts Pamphlet - This 13 page, color pamphlet discusses many subjects on microbiotic crusts, including: "What are microbiotic crusts?", "Where do they occur?", "What is their role?" and "How are they affected by disturbance?". The pamphlet was developed by the Soil Quality Institute in cooperation with the Grazing Lands Technology Institute.

3. Phosphorus In Agriculture Technical Pamphlet - This pamphlet describes the importance of phosphorus in plant growth, the environmental impacts, and the management of agricultural phosphorus (January, 1998). Available on the website: http://www.statlab.iastate.edu/survey/SQI/ sqihome.shtml.

4. Quantification of Soil Quality paper - The paper discusses various approaches to quantifying soil quality and recommends a framework for measuring and assessing soil quality. A review of the definition, indicators, and indices of soil quality, minimum data sets and effects of scale are presented. This paper was prepared for an international symposium on Carbon Sequestration in Soils held in Columbus, OH. July 22-26, 1996. The reference to this paper is Seybold, C.A., M.J. Mausbach, D.L. Karlen, and H.H. Rogers. 1998. Quantification of soil quality. p. 387-404. *In*: R. Lal, J.M. Jimble, R.F. Follet, and B.A. Steward (eds.) Soil processes and the carbon cycle. Advances in Soil Science. Chapter 27. CRC Press, Boca Raton, Florida.

5. Soil Biology Primer - The Soil Biology Primer is an introduction to the living soil system for NRCS field staff, partners and customers. This full color set of 9 pamphlets describes the importance of soil organisms and the soil foodweb to soil productivity, water and air quality, and addresses how soil organisms are affected by management practices. The Primer is a collaborative effort of the SQI, an Oregon State University soil ecologist and soil entomologist, an Ohio State University earthworm ecologist, and numerous other scientists. (Available Fall, 1998)

6. Soil Quality - A Multitude of Approaches Presentation - This presentation describes the soil quality concept and approaches to soil quality assessment. The presentation was the keynote address at the Kearney Foundation Symposium, "California Soil Quality: From Critical Research to Sustainable Management", March, 1997. It is available from the web site: http://www.statlab.iastate.edu/ survey/SQI/sqihome.shtml.

7. Soil Quality-Agronomy Technical Notes. This is a series of 2 to 4 page documents describing the effects of conservation practices on soil quality. The notes are intended for NRCS field office use. http://www.statiab.iastate.edu/survey/SQI/agronomy.shtml.

Topics:

Cover and Green Manure Crop Benefits on Soil Quality	(Technical Note #1)
Conservation Crop Rotation Effects on Soil Quality	(Technical Note #2)
Effects of Residue Management, No-till on Soil Quality	(Technical Note #3)
Effect of Soil Quality on Nutrient Efficiency	(Technical Note #4)
Herbicides	(Technical Note #5)
Legumes and Soil Quality	(Technical Note #6)

8. Soil Quality Card Design Manual - The Soil Quality Card Design Manual gives instructions and procedures for conducting farmer focus sessions and developing local Cards. The Soil Quality/Health Card is a qualitative field assessment tools developed by farmers for farmers. It is a do-it-yourself rating guide for farmers to monitor soil quality from year to year or to compare practices. Conservationists can use it in locally led conservation, education and information activities with farmers. The procedures and Manual were developed by the SQI in collaboration with Oregon State University, Oregon State University Cooperative Extension, University of Maryland, and NRCS partners in state and field offices in OR, MD, MT, ND, and NM. The Manual will be available on the Web soon.

9. Soil Quality Card - Willamette Valley, Oregon - This Soil Quality Card was developed by farmers in the Willamette Valley of Oregon. It is a do-it-yourself rating guide for farmers to monitor soil quality from year to year or to compare practices. It was developed by the SQI in collaboration with Oregon State University, Oregon State University Cooperative Extension, SWCD's and NRCS state and field offices in OR. For a booklet of 50 cards, contact Publications Orders, Extension and Station Communications, Oregon State University, 422 Kerr Administration, Corvallis, OR 97331-2119. FAX: 541-737-0817

10. Soil Quality Clipart - The SQI designed several clipart images to represent soil and its many functions (infiltration, nutrient cycling, productivity, structural support, filtering and buffering, partitioning water and solute flow). Also available is a set of images depicting farmers using the soil health card. These black and white graphics are available for free use. Images can be downloaded from the SQI homepage. http://www.statlab.iastate.edu/survey/SQI/sqihome.shtml. The files are also available via anonymous ftp at: ftp://ftp.nstl.gov/software.sqclip.

11. The Soil Quality Concept booklet - This booklet contains eight key papers on the concepts of soil quality. It provides information and references on soil quality for NRCS staff and is valuable as background information to support the integration or soil quality with conservation planning and natural resource inventory activities of the agency. (October, 1996)

12. Soil Quality Considerations in the Conversion of CRP Land to Crop Production - The "Soil Quality Considerations in the Conversion of CRP Land to Crop Production" presentation discusses the beneficial effects of CRP on soil quality, the concerns of returning CRP land to crop production, and altemative systems to protect the soil quality benefits obtained from ten years of grass cover. The presentation was made at CRP-96 Conference, "Preparing for Future CRP Land use in the Central and Southern Great Plains", Amarillo, TX (October, 1996). The paper from this presentation is available from the web site: http://www.statlab.iastate.edu/survey/SQI/sqihome.shtml

13. Soil Quality Field Kit - The Soil Quality Field Kit, adapted from the ARS Soil Health Kit, is designed for use by NRCS field offices, SWCD's/RCD's and ag consultants. Soil measurements made with the kit are (1) pH, (2) electrical conductivity, (3) soil nitrate-N, (4) soil bulk density/water content, (5) soil respiration, (6) infiltration rate, (7) aggregate stability, (8) soil stability, (9) earthworms, and (10) soil morphological observations. The SQI has developed an Instruction Manual and Interpretative Guide to accompany the kit. Instructions for building the kit and both the manuals are available on the website http://www.statiab.iastate.edu/survey/SQI/sqihome.shtml

14. Soil Quality Information Sheets - These one-page, full color information sheets are useful as an introduction to soil quality for employees, districts, agriculture consultants, producers and others. The National Soil Survey Center prepared the information sheets in cooperation with the Soil Quality Institute and the National Soil Tilth Laboratory, Agricultural Research Service, USDA. Current Topics
Include:

Soil Quality - Introduction	(April, 1996)
Indicators for Soil Quality Evaluation	(April, 1996)
Soil Quality Indicators: Organic Matter	(April, 1996)
Soil Quality Indicators: Soil Crusts	(April, 1996)
Soil Quality Indicators: Aggregate Stability	(April, 1996)
Soil Quality Indicators: pH	(May, 1998)
Soil Quality Indicators: Infiltration	(May, 1998)
Soil Quality Resource Concerns: Soil Erosion	(April, 1996)
Soil Quality Resource Concerns: Sediment Deposition on Crop Land	(April, 1996)
Soil Quality Resource Concerns: Compaction	(April, 1996)
Soil Quality Resource Concerns: Salinization	(May, 1998)
Soil Quality Resource Concerns: Pesticides	(May, 1998)
Soil Quality Resource Concerns: Available Water Capacity	(May, 1998)
Soil Quality Resource Concerns: Soil Biodiversity	(May, 1998)

For more information, contact Gary Muckel, National Soil Survey Center, (402) 437-4148 or E-mail gmuckel nssc600.nrcs,usda.gov. The sheets are available on the WEB at http://www.statlab.iastate.edu/survey/SQI/sqfinfo.shtml.

15. Soil Quality Institute Pamphlet - The Soil Quality Institute pamphlet describes the mission and vision of the Soil Quality Institute. It provides an introduction for NRCS and our conservation partners on the concept of soil quality, soil quality resource concerns, and implementation strategies to achieve soil quality.

16. Soil Quality Reference Soils - The Soil Quality Institute and Auburn University collaborated to establish a set of 27 soils for use as a standard reference set for soil quality research. The soils were selected on the basis of acreage, land use, economics and environmental importance. A US map of the reference soils can be viewed from the 'Soil Quality Reference Soils' link on the SQI homepage (URL: http://www.statlab.iastate.edu/survey/SQI/sqihome.shtml).

17. Soil Resilience/Soil Quality Conference Presentation - This presentation addresses the concept of soil resilience and its relationship to soil quality. It presents the concept of resilience as it pertains to soils, and provides a review of the literature on its assessment and quantification. The presentation was made at the National Cooperative Soil Survey Conference

in Baton Rouge, LA, June 16-20, 1997. The paper from this presentation is available from the web site: http://ww,w.stadab.iastate. edu/survey/SQI/sqihome.shtmI

The BLM is currently preparing the following:

1. Soil Quality Information Series tailored for Rangeland. This information is very similar to the Soil Quality Information Sheets prepared by the National Soil Survey Center in cooperation with the Soil Quality Institute. They are being prepared jointly with the NRCS. Topics will include:

A. Soil Quality - Introduction to Rangelands

B. Indicators for Soil Quality Evaluation-Rangeland

C. Soil Quality Indicators-Rangelands
   1) Organic Matter
   2) Soil Crusts
   3) Aggregate Stability
   4) Compaction
   5) pH
   6) Infiltration
   7) Salinity

2. Rangeland Soil Quality Guide entitled "Soil Quality Information For Land Management Decisions". The development of this guide is currently underway. This guide is an assemblage of rangeland soil information in a loose-leaf notebook format, tabbed to provide easy access to information by subject, and most importantly to provide for periodic inserts for new material and revisions of existing contents.

The guide will contain definitions, fact sheets, and discussions on soil function, soil degradation, soil health indicators, evaluation techniques, models and data bases, reference lists, etc.

This information source will provide a "From the Ground-up Approach to Rangeland Health" and strongly supports and compliments the BLM Healthy Rangeland Initiative. It will provide background information and assistance for Implementation of the Standards and Guidelines for Healthy Rangelands. I invite your comments, recommendations, and participation in this activity.

New Mexico Bureau of Mines and Mineral Resources at **http://geoinfo.nmt.edu.**

Forest Service - Soil Quality Protection Standards

Region I - Northern Region

Soil Quality Standards - Management activities create various amounts of soil disturbance but ecologically sustainable land stewardship can minimize significant adverse impacts on soils. **Soil quality standards provide threshold values that indicate when changes in soil properties and soil conditions would result in significant change or impairment of soil quality based on available research and Regional experience.** Proper application of these standards requires professional knowledge and judgement. If soil quality standards are not met in initial entries, then future entries should be planned to avoid further impacts and to apply practical mitigative measures that would leave the site in a condition that meets soil quality standards following management activities.

Soil quality standards apply to lands where vegetation and other resource management are the principal objectives, i.e. timber sales, grazing pastures or allotments, wildlife habitat and riparian areas. The standards do not apply to intensively developed sites as mines, developed recreation sites, administrative sites, or rock quarries. Permanent roads do affect soil-hydrologic function, however, their evaluation is more appropriately done on a watershed basis using models and other watershed analysis techniques.

Detrimental Soil Disturbance includes the effects of compaction, displacement, puddling, severe burning, surface erosion, loss of surface organic matter, and soil mass movement. **Cumulatively, a minimum of 85% percent of an activity area must remain in as acceptable soil quality condition.**

For additional information, please contact John Nesser, Regional Soil Scientist at **jnesser/r2@fs.fed.us.**

Region 2 - Rocky Mountain Region

Soil Quality Standards

1. Detrimental Compaction, Displacement, Puddling, Severe Burning and Erosion - No more than 15 percent of an activity area will be left in a detrimentally compacted, displaced, puddled, severely burned, and/or eroded condition. This does not include the permanent transportation system.

2. Effective Ground Cover - Required Minimum Percent Effective Ground Cover for the first and second year after disturbance:

Erosion Hazard Class	1st Year (%)	Second Year (%)
Low	50	70
Moderate	40	60
High	30	50
Very High	30	50

For additional information, please contact Jerry Freeouf, Regional Soil Scientist at: **jfreeouVr2@fs.fed.us.**

Region 3 - Southwestern Region

Soil Condition - An evaluation of soil quality based on an interpretation of factors that affect vital soil functions. These specific soil functions are 1) The ability to hold, accept and release water, 2) the ability to hold, accept and release nutrients and other chemicals and 3) the ability to resist degradation. Categories of soil condition are satisfactory, impaired, and unsatisfactory.

Satisfactory - Indicators signify that soil quality is being sustained and the soil is functioning properly and normally. The ability of the soil to maintain resource values, sustain outputs, and recover from impacts is high.

Impaired - Indicators signify a reduction of soil quality. The ability of the soil to function properly has been reduced and/or there exists an increased vulnerability to irreversible degradation. An impaired category should signal land managers that there is a need to further investigate the ecosystem to determine the cause and degree of decline in soil function. Changes in management practices or other preventative actions may be appropriate.

Unsatisfactory - Indicators signify that degradation of soil quality has occurred. Impairment of vital soil function result in the inability of the soil to maintain resource values, sustain outputs, and recover from impacts. Soils rated in the unsatisfactory category are candidates for improved management practices or restoration to recover soil function.

For additional information contact Wayne Robbie at wrobbie/r3 @ fs.fed.us or Penny Luehring at pluehring/r3 @fs.fed.us.

Region 4 - Intermountain Region

Soil Quality Standards - Soil resource management must be consistent with the Forest Service goal of maintaining or improving long-term soil productivity (NFMA) and soil hydrologic function.

Soil Quality Guidelines - Management activities can damage soils by compaction, puddling, displacement, severe burning, or organic matter loss. Damage from accelerated surface erosion or mass movement can occur during or following management activities. Soil damage is detrimental when it adversely affects hydrologic function or causes site productivity losses. Soil quality guidelines provide for the maintenance of soil properties that affect soil productivity and hydrologic function.

For additional information contact Tom Collins, Regional Soil Scientist at tcollinstr2@fs.fed.us.

Region 5 - Pacific Southwest Region

Soil Quality Standards - Soil quality analysis standards provide threshold values that indicate when changes in soil properties and soil conditions would result in significant change or impairment of the productivity potential, hydrologic function, or buffering capacity of the soil. Detrimental soil disturbance is the resulting condition when threshold values are exceeded.

The extent of detrimental soil disturbance that affects soil productivity, shall not be of a size or pattern that would result in a significant change in production potential for the activity area. The size or extent of detrimental soil disturbance allowable that affects hydrologic function is determined by the Region 5 Cumulative Watershed Effects Analysis (R-5 FSH 2509.22, Ch. 20)

and/or the Region 5 Soil Erosion Hazard Rating system (R5 FSH 2509.22, Ch. 50, ex. 2, HC) depending on which method is sensitive to the size of area being analyzed.

For additional information contact Rob Griffith, Regional Soil Scientist at **rgriffith/r2@fs.fed.us.**

Region 6 - Pacific Northwest Region

Compaction, Displacement, Puddling, Severely Burned - Leave a minimum of 80% of an activity area in a condition of acceptable productivity potential for trees and other managed vegetation following land management activities. Surface soil conditions known to result in reduced productive land surface and the accompanying criteria for determining when and where these conditions occur are compaction, displacement, puddling, and severe burning.

Surface Erosion - To meet acceptable levels of soil loss and soil management objectives, the minimum percent effective ground cover following cessation of any soil-disturbing activity should be:

Erosion Hazard Class	1st Year (%)	2nd Year (%)
Low (Very Slight-Slight)	20-30	30-40
Medium (Moderate)	30-45	40-60
High (Severe)	45-60	60-75
Very High	60-75	75-90

Region 8 -- Southern Region

Soil Quality Standards

Soil quality standards are applied to areas where management prescriptions are being implemented. They are not intended to apply to areas with dedicated uses such as administrative sites, system roads and trails, campgrounds and special use areas.

These standards will be tested during monitoring and modified as needed based on the monitoring results. Activities should be planned and implemented to avoid significant impacts to soil productivity and/or extra investments to ameliorate the loss soil productivity. Some Forest Plans may contain more restrictive standards and should not be modified to conform to the following threshold values unless monitoring data indicates the need.

Minimum soil quality standards are met when the physical, chemical, and biological properties of the soil are not significantly impaired. Soil impairment does not occur when the following are within limits.

At least 85 percent of an activity area is left in a condition of acceptable soil productivity potential following land management activities. If there are ma or soil/slope differences within an activity area these will be evaluated separately.

Compaction in an activity area should not significantly impair soil productivity. Since soil texture influences bulk density, the allowable change in bulk density should be determined for each soil type.

For additional information, please contact Jerry Ragus at **jragustr2Ws.fed.us.**

Region 10 -- Alaska Region

Areal Extent Standards

Detrimental Compaction, Displacement, Puddling, Mass Movement, Erosion and Severely Burned --Leave a minimum of 85% of an area in a condition of acceptable productivity potential for trees and other managed vegetation following land management activities. Specified (system) roads which include cut, fill, road bed, landings and log transfer facilities are excluded from the activity area, but side cast and other waste materials are not excluded.

Ground Cover -- The minimum percent effective and uniform ground cover, following a ground disturbing activity, must be at least:

85% on slopes less than 35%,
90% on slopes 35--75%
95% on slopes greater than 75%

Soil Drainage and Wetness -- Detrimental altered wetness can occur in no more than 5% of an activity area.

For further information, please contact Terry Brock at **tbrock/r2@fs.fed.us**

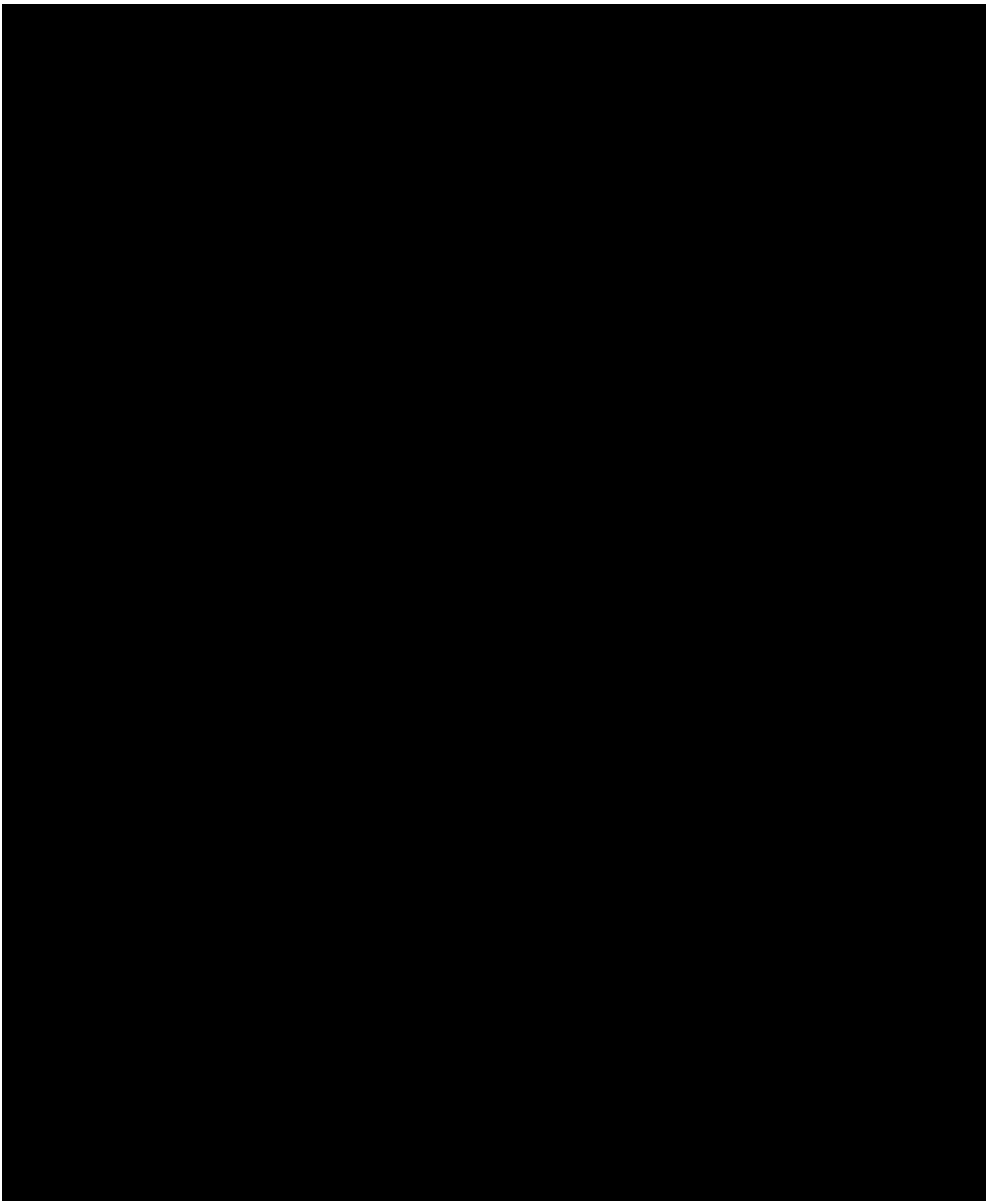
ADDITIONAL SOIL QUALITY INFORMATIONAL PRODUCTS RECOMMENDED

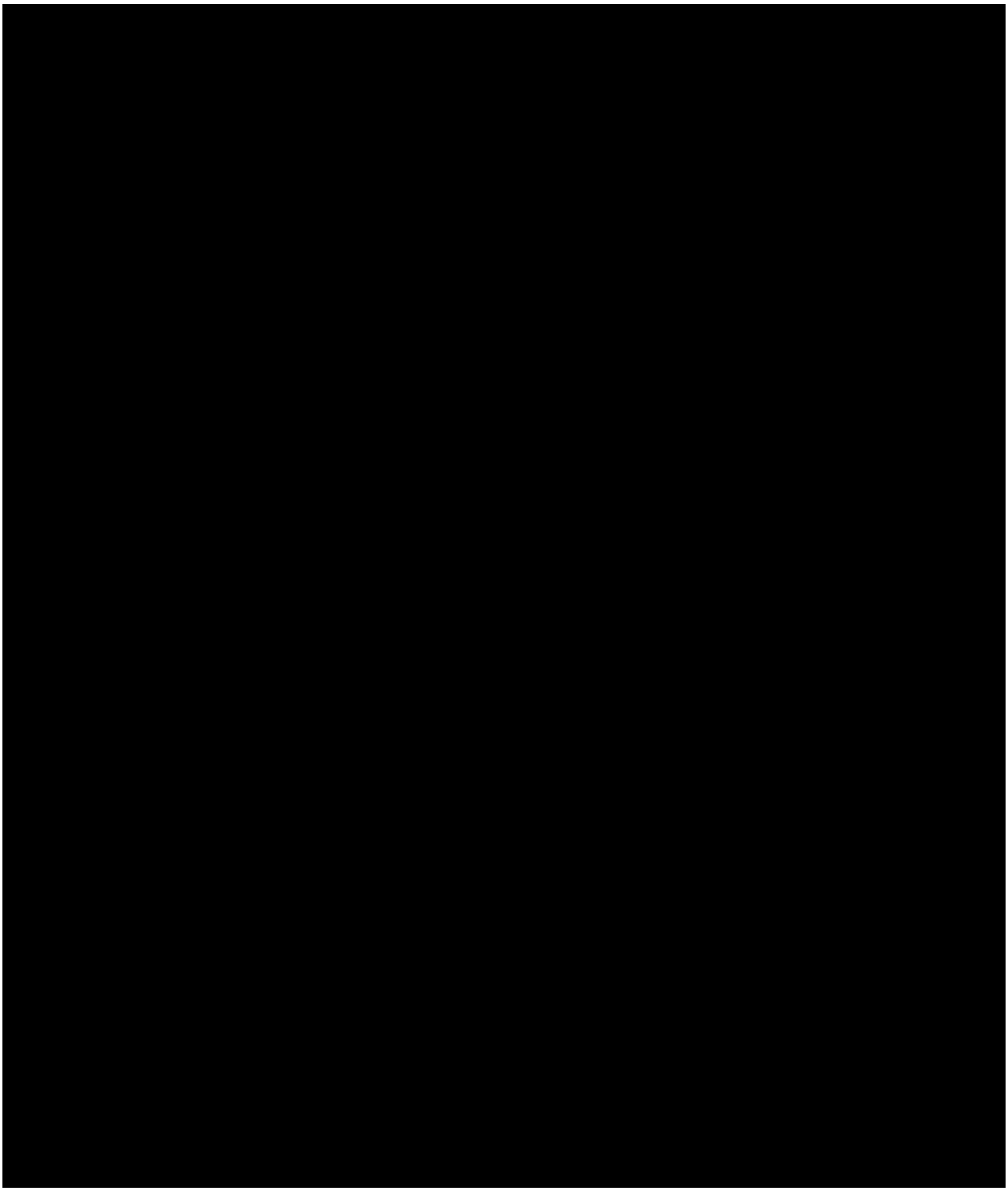
Bill Ypsilantis

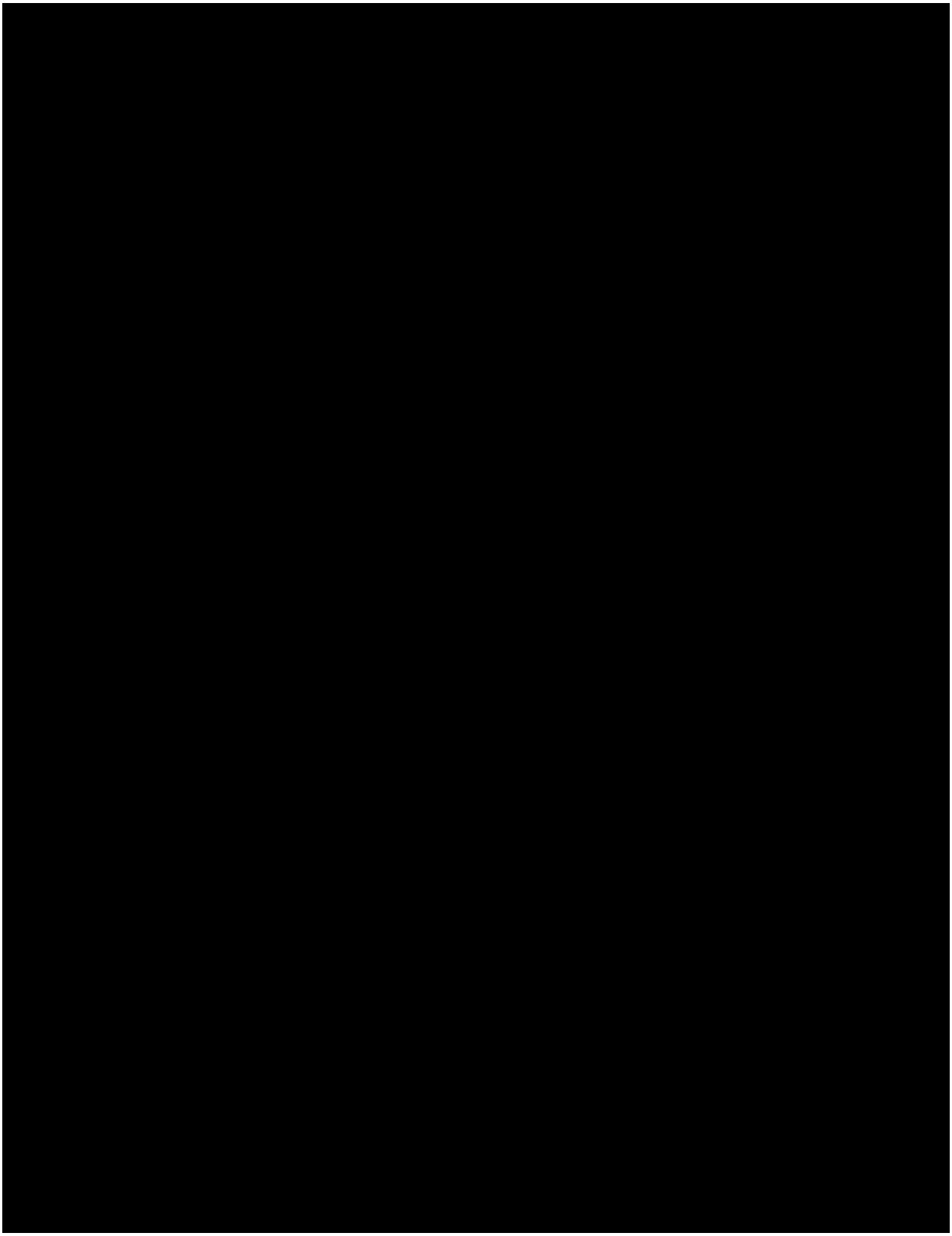
Soil scientists need to include information about biological soil crusts (microbiotic soil crusts) when describing pedons on rangeland. The percent cover of biological soil crusts and relative amount of lichens, mosses and cyanobacteria need to be recorded for each pedon description. It would take a squirt bottle and five minutes to train employees and to have them perform this task in field, according to Jayne Belnap. In turn, this pedon description information should be accessible to researchers to that they can incorporate it into their studies.

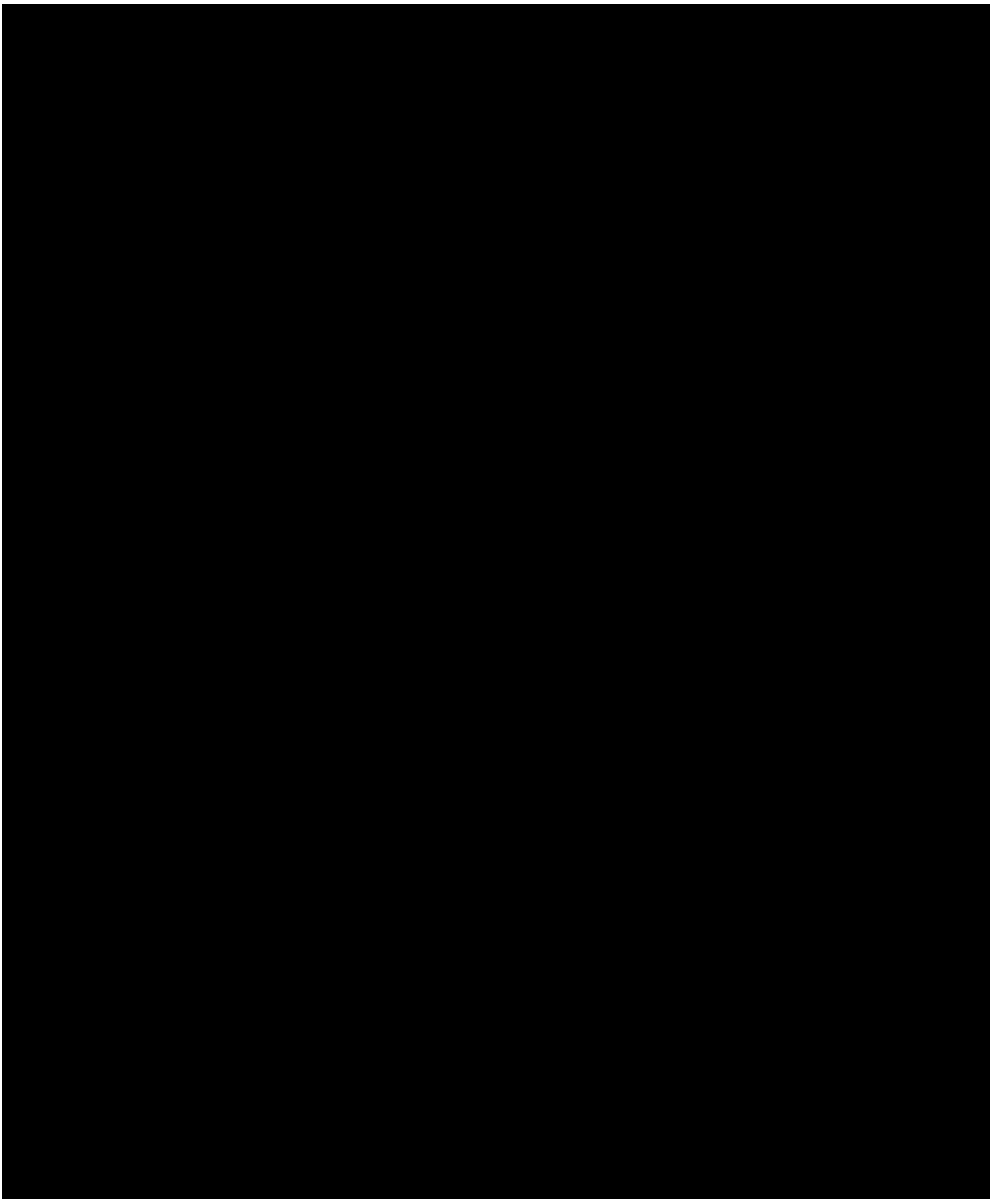
Include information about soil biological crusts in range site descriptions.

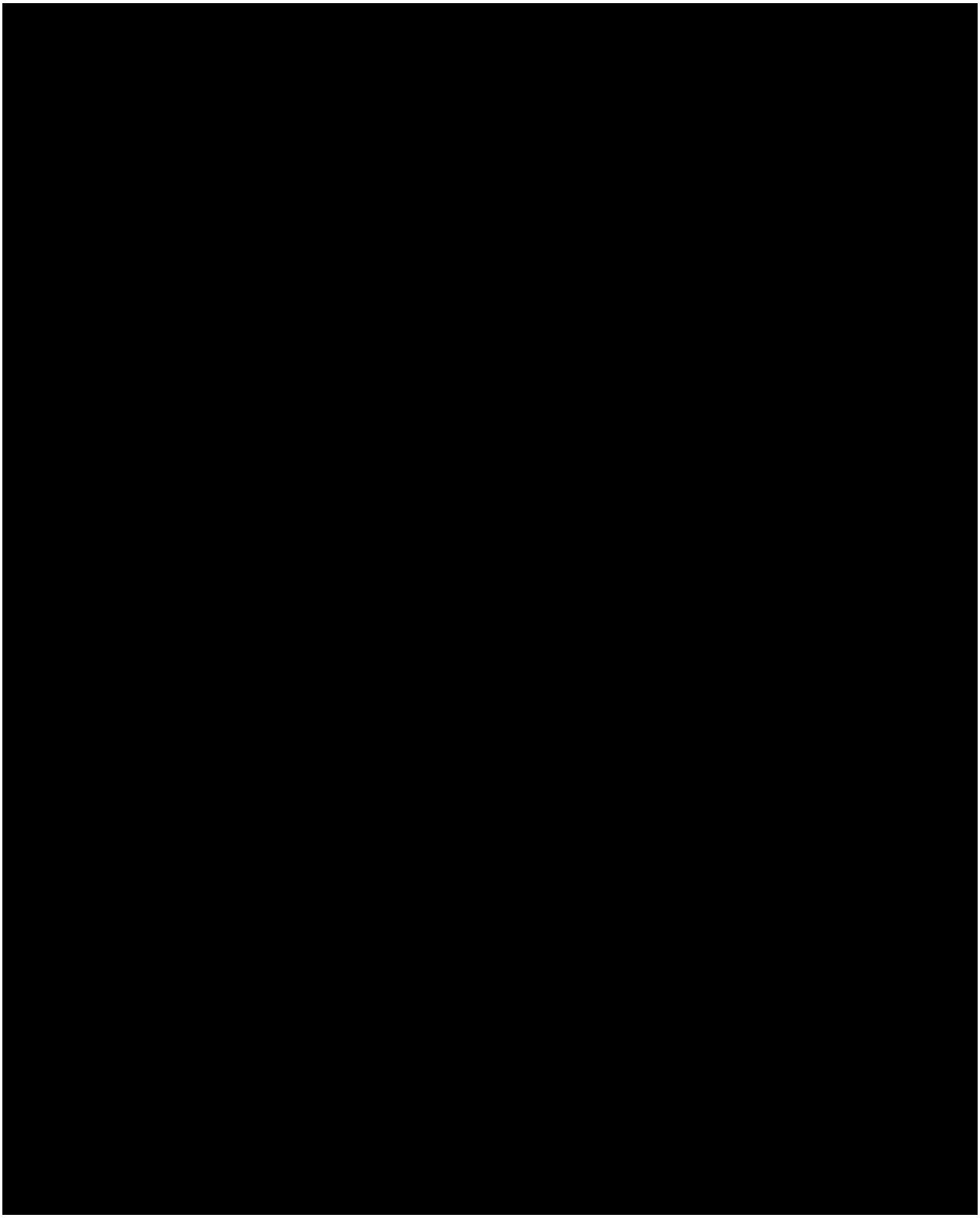
Send representative samples of benchmark soils or those with suspected soil quality problems to the soil lab for assessment of soil biological activity from bacteria, fungi, etc.

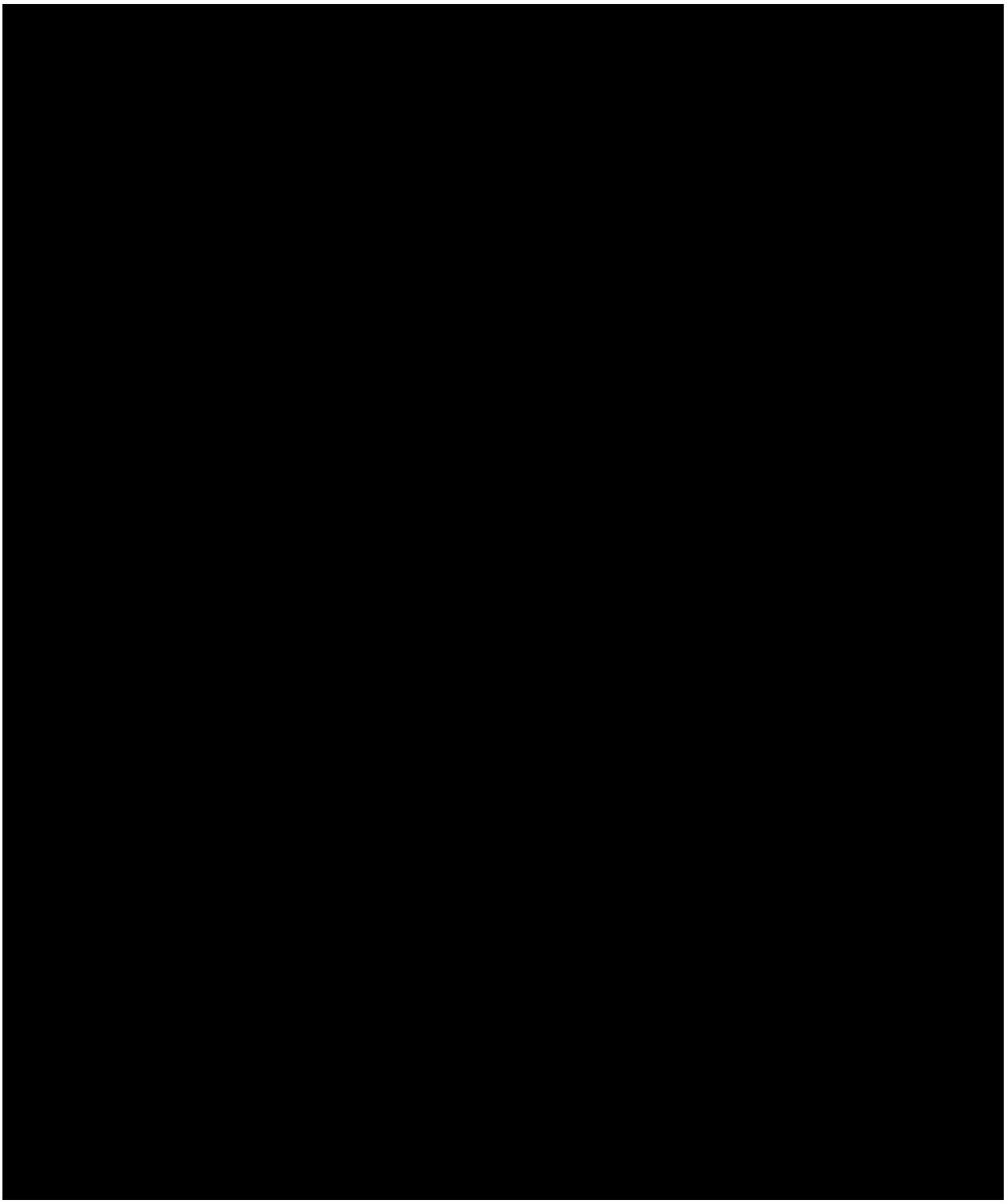












May 18,1998

Kenneth F. Scheffe
NRCS
6200 Jefferson, NE, Suite 305
Albuquerque, NM 87109

Dear West Region National Cooperative Soil Survey Member

As chairpersons of a West Regional NCSS conference committee on Technological Applications in Soil Survey, Mike Hansen, Chris Smith, Steve Strenger and I have been asked to initiate an inventory of technological applications related to soil surveys.

This inventory is to encompass technological applications developed or improved within the last 10 years which are used in producing soil surveys and those which use soil surveys as a source of data. These technologies could range from computer programs or other decision--making processes to equipment for determining soil properties.

Examples include, but are not limited to:

Models which use soil data, including those that predict how soils react when subjected to various conditions.

Technologies for producing soil surveys which improve efficiency of soil mapping, the reliability of soil maps, or the reliability of soil property data.

As committee Chairpersons, we would like your help with this inventory by providing us with information on the technologies that you have used or are developing.

Please provide us with the name of the application, a brief statement which describe the uses of application, and the name, organization, address, and phone number ofa person who could be contacted by others who are interested in the technology.

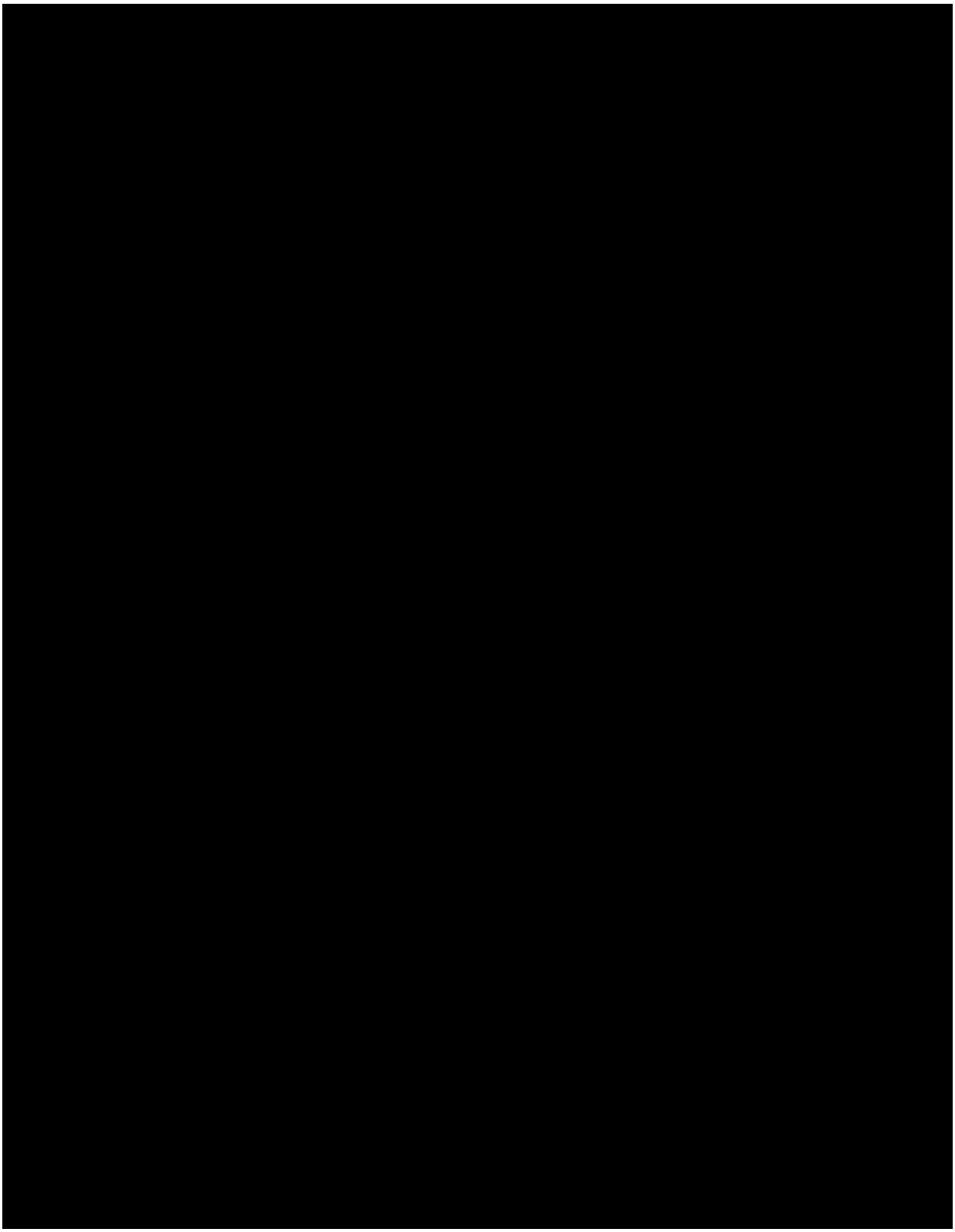
If possible, please provide us this information by May 29, 1998.

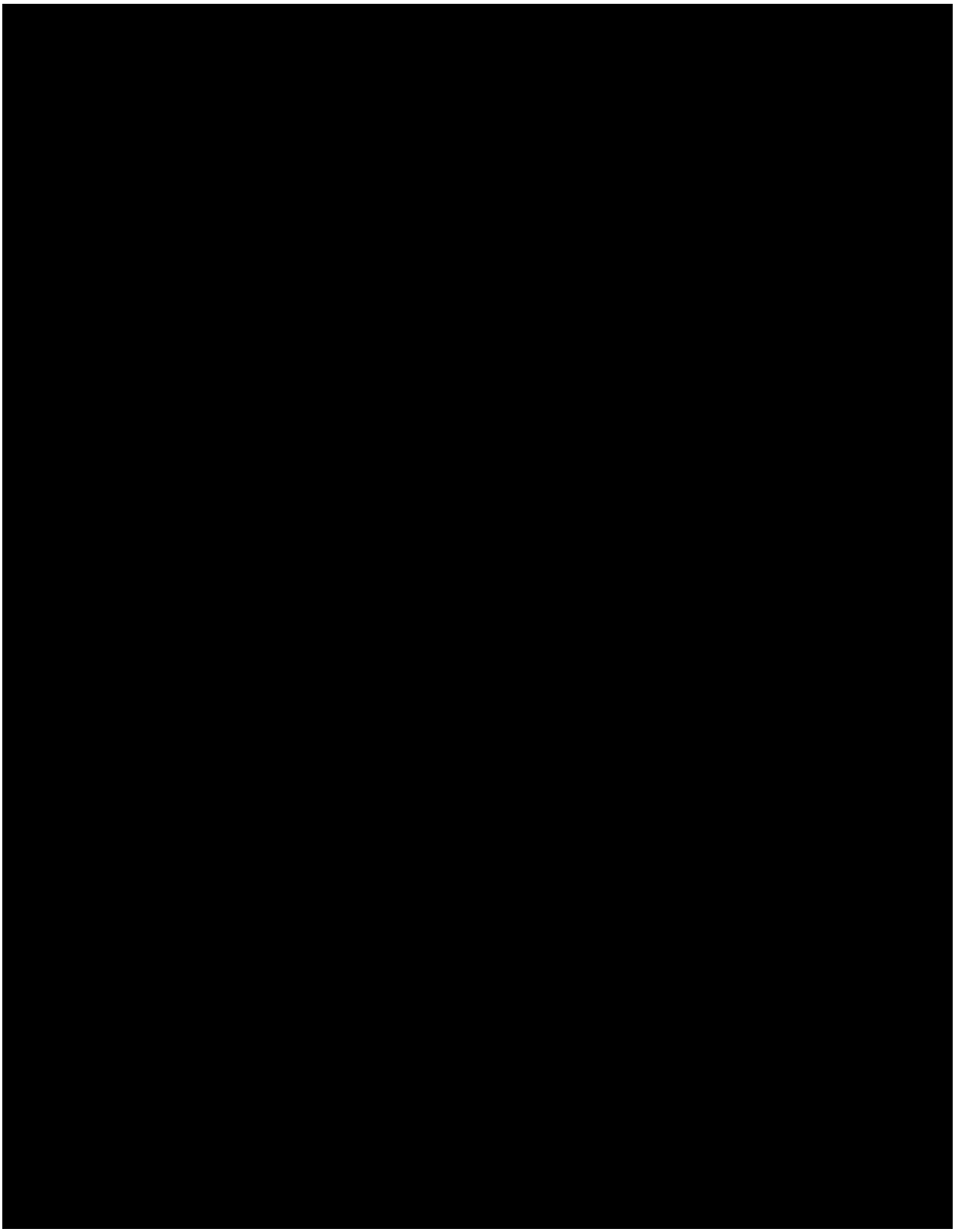
Responses should be sent to:

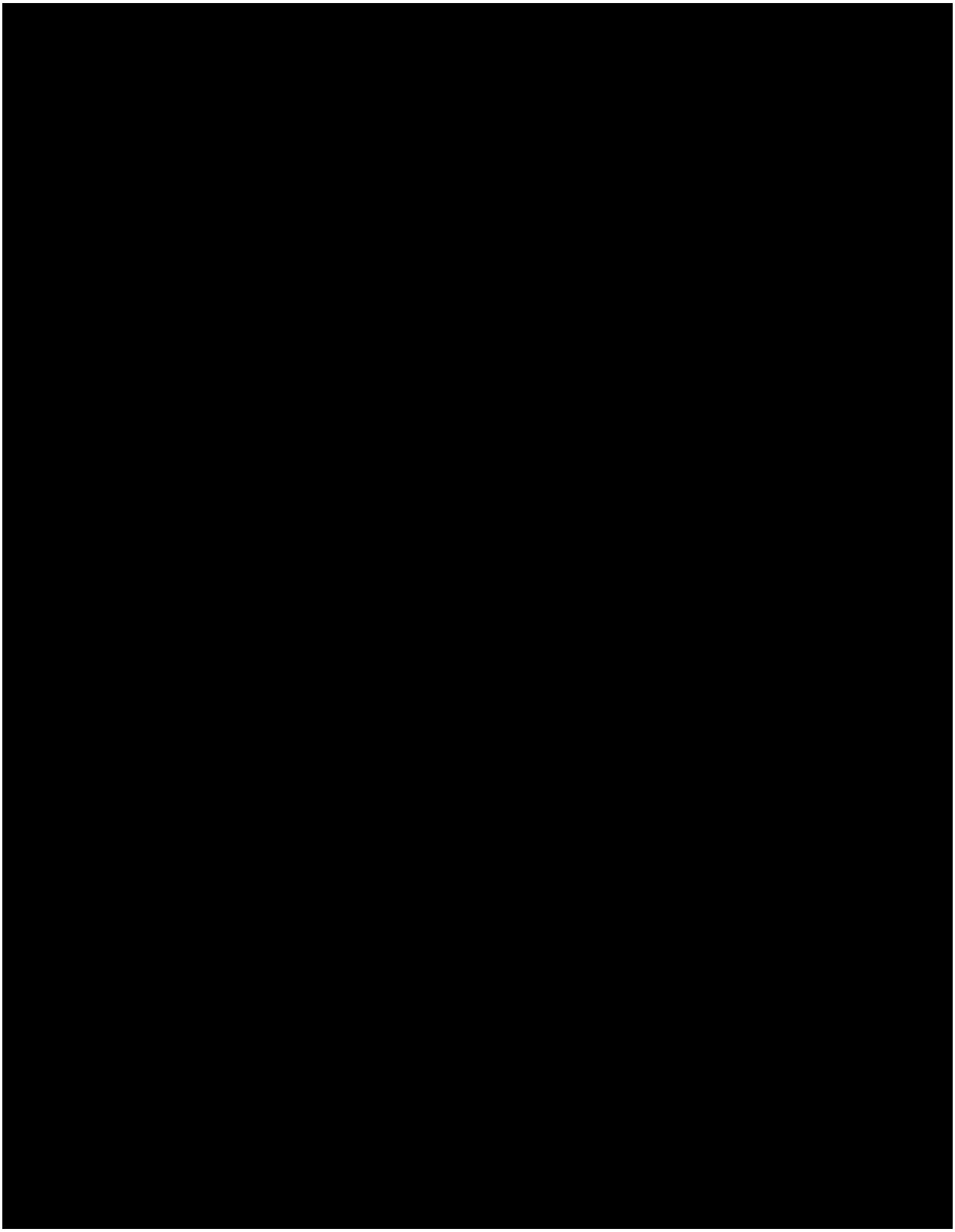
Darrell Schroeder, State Soil Scientist
Natural Resources Conservation Service
Federal Building, Room 3124, 100 East B Street
Casper, WY 82609
Email: dschroeder@wy.nrcs.usda.gov
307-261-6491; FAX 307-261-6490

Sincerely,

West Regional NCSS Conference Committee on Technological Applications In Soil Survey Chairpersons - Darrell Schroeder, NRCS, WY; Mike Hansen, NRCS, MT; Chris Smith, NRCS, HI; Steve Strenger, USFS, NM



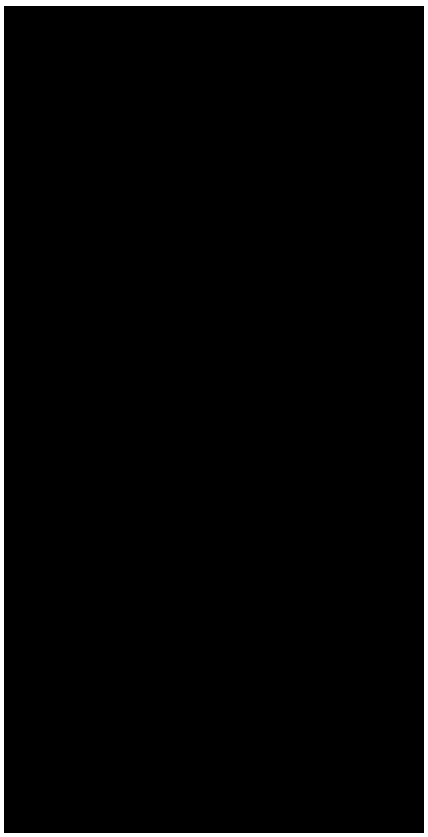




National Cooperative Soil Survey

Western Regional Conference

June 14-19,1998



Business Meeting

Report of Business Meeting

West Regional National Cooperative Soil Survey Conference

Albuquerque, NM
June 19, 1998

Meeting called to order by Ken Scheffe, Conference Co-Chair at 10:30am
(Curtis Monger, NMSU, Co-Chair)

Review of Committee Reports
The reports of the committees were reviewed and voted upon for acceptance.

1. Soil Quality Products Committee - Tim Sullivan, USFS, Chair Report reviewed, motion to accept report made by Bill Dollarhide; seconded by Hal Swenson; passed by acclamation.

2. Technology to Enhance Soil Survey- Daryl Schroder, NRCS, Chair Report reviewed, motion to accept report made by Al Amen; seconded by Phil Camp; passed by voice acclamation.

3. MLRA/Ecoregion Update Committee- Steve Park, NRCS, Chair Report reviewed, motion to accept report made by Louis Daniels; seconded by Russ Pringle; passed by voice acclamation.

4. Soil Taxonomy Committee - Bob Engel, NRCS, Chair Report reviewed, motion to accept report by Hayes Dye; seconded by Hal Swenson; passed b voice acclamation.

5. Research Committee- Curtis Monger, NMSU, Chair Report reviewed, motion to accept report by Bruce Frazier, seconded by Bill Dollarhide; passed by voice acclamation.

Old Business
No old business was brought before the business meeting.

New Business
Recommendation to form Regional Technical Committee for Hydric Soils (RTC-HS). Russ Pringle introduced this subject and discussed the need for and functions of this committee. He also recommend its placement as a STAN DING COMMITTEE of the West Region National Cooperative Soil Survey. This committee would be chaired initially by Russ Pringle and the following were recommended to Russ as possible member of this committee: Janis Boettinger, Chris Nobel, Glen Stanissauski, and Terry Brock. Motion for the formation of the Regional Technical Committee for Hydric Soils made by Russ Pringle; seconded by Chuck Gordon; passed by voice acclamation. Motion to select Russ Pringle as chairman was made by Bill Dollarhide; seconded by Eric Vinson; passed by voice acclamation.

Recommendation to form a Soil Taxonomy STANDING COMMITTEE to the Western Regional Cooperative Soil Survey was introduced by Bob Engel. Bob Engel gave background to this recommendation. The West Region NCSS had a Soil Taxonomy Committee in previous years, but the committee had been dissolved. Bob wished the committee be brought back as a Standing Committee. He noted that Bob Ahrens, National Leader for Soil Taxonomy would serve as chair of the committee and he would select members from recommendations of voting member representatives. Motion to form a Soil

Taxonomy Standing Committee was made by Bill Dollarhide; seconded by Hal Swenson; passed by voice acclamation.

No other new business brought to the steering committee.

Selection of Site and Chair of Year 2000 Meeting

The floor was opened for nominations or volunteers to host the next Western Regional NCSS Conference in 2000.

Ken Scheffe, co-chair of committee reported he had received a call from Chris Smith, NRCS State Soil Scientist, Hawaii, during the meeting. Chris was unable to attend this year's conference, but was considering volunteering to host the next regional conference in Hawaii and wanted some additional information on how difficult it was putting the conference. Ken responded that it wasn't too hard once you got started. Chris said he would like to volunteer to host the Western Regional NCSS Conference in 2000 and it would likely be held earlier than June due to the cost increases and limited facilities during the tourist season. These conversations were reported during the business meeting.

There were no other volunteers to host, nor were any other nominations made for consideration. Bruce Frazier made a motion to cease nominations and select Hawaii by virtue of it being the only nomination; seconded by Hal Swenson, and the motion passed by voice acclamation. The next Western Regional NCSS Conference will be held in 2000 in Hawaii and hosted by Chris Smith of NRCS.

There being no more new business, a motion to adjourn was made by Bill Dollarhide; seconded by Hayes Dye; and passed by voice acclamation.

Adjourn - 12:00 noon

WESTERN REGIONAL COOPERATIVE SOIL SURVEY CONFERENCE

PURPOSE, POLICY, AND PROCEDURES
July 1996

I. Purpose of the Conference

The purpose of the Western Regional Cooperative Soil Survey Conference is to bring together Western States representatives of the National Cooperative Soil Survey for discussion of technical and scientific questions. Through the actions of committees and conference discussions, experience is summarized and clarified for the benefit of all; new areas explored; procedures are synthesized; and ideas are exchanged and disseminated. The conference also functions, as a clearing house for recommendations and proposals received from individual members and State conferences for transmittal to the National Cooperative Soil Survey Conference.

II. Membership

A. Permanent Membership

Permanent members of the conference include those individuals or positions listed on the attached Permanent Membership List. Individuals or organizations may be added to the list as deemed necessary by the current Steering Committee. The list will include agency, name (where known), title, address, and phone number.

B. Associate Membership

Invitations may be extended to a number of other individuals to participate in a specific conference or conferences. Any soil scientist, technical specialist, or other individual of any local, state, or federal agency or interest group whose participation will benefit particular objectives or projects of the conference may be invited to participate. Any permanent member of the conference may invite one additional participant. If a permanent member wishes to invite more than one guest (or associate member), the request should be cleared through the Chairman or Co-Chairman of the conference**,** or the Chairman of the Steering Committee. Names of all associate members of a specific conference should be sent to the conference chairman.

III. Officers

A. Chairman, Co-Chairman and Secretary

A chairman, co-chairman and secretary of the conference are elected to serve for two-year terms. Elections are held during the biennial business meeting. Election of officers follows the selection of a place for the next meeting, and will be from the state hosting that meeting. Officers rotate among the agencies. This is, the chairman-elect must represent a different agency than the past chairman. Similarly, the co-chairman and secretary must be of different agencies than their predecessors.

Responsibilities of the chairman include the following (specific tasks maybe delegated to the co-chairman):

1. Planning and management of the biennial conference.

2. Function as a member of the steering committee.

3. Preside at the conference business meeting.

4. Issue announcements and invitations to the conference.

5. Organize the program of the conference, select presiding chairman for the various sections, wTite the program, and have copies of the program prepared and distributed.

6. Make necessary arrangements for lodging accommodations for conference members, for food functions, if any, for meeting rooms (including committee rooms), for a field trip, and for local transport for other official functions.

7. Duplicate and distribute the Proceedings of the Conference.

8. Provide for appropriate publicity for the conference.

9. Arrange for guest speakers for the conference.

10. Preside over the business meeting of the conference.

Responsibilities of the co-chairman include the following:

1. Function as a member of the steering committee.

2. Act for the chairman in the chairman's absence or disability.

3. Assist the chairman in carrying out the chairman's responsibilities, and perform duties as assigned by the chairman.

Responsibilities of the Secretary include the following:

1. Maintain minutes of the conference business meetings and other conference meetings as assigned by the chairman.

2. Obtain copies of all committee reports and papers presented at the conference, and see that copies are made available to all conference members.

3. Compile the conference proceedings and assist the chairman in the duplication and distribution of the proceedings.

B. Steering Committee

A Steering Committee will be selected to assist in the planning and management of the biennial conference. The Steering Committee consists of:

The conference chairman.
The conference co-chairman.
The conference secretary.
The conference past chairman.
NSSC Representative.
All other permanent members for the host state.

Responsibilities of the Steering Committee:

1. Formulate committee charges as recommended by the conference.

2. Select committee chairman and committee members as recommended by the conference.

3. Review conference activities and develop an executive summary of conference recommendations.

4. Send applicable conference recommendations to the Steering Committee chairman of the National Cooperative Soil Survey Conference.

5. Send applicable conference recommendations to the soil survey leaders of appropriate agencies for consideration and possible implementation.

note. The NSSC Representative will serve as an associate member to maintain files, by-laws, committee rosters/charges, proceedings, and assist with conference coordination.

C. Advisors

Advisors to the conference are the State Conservationist of the host state, or as selected by the conference, the Experiment Station Director for the host state, or as selected by the conference, a Soil Scientist on the NRCS West Regional Conservationist staff, as selected by the conference, and a Soil Scientist on the NRCS Northern Plains Regional Conservationist staff, as selected by the conference. A Forest Service Regional Forester and BLM State Director may also serve as advisors as requested by the conference.

D. Committee Chairman

Each conference committee has a chairman. The chairmans are either selected by the conference or are appointed by the Steering Committee.

IV. Meetings

A. Time of Meetings

The conference convenes every two years, in even numbered years. It is held the second full week in February, unless a different state is agreed upon by a majority of conference members.

B. Location of meetings

The conference will be held on a rotational basis throughout the region. Any permanent member may invite the conference to meet in their state. The conference members at their biennial business meeting will vote on which invitation to accept, or where to hold the meeting if no invitations are received. If no state offers to host the conference, and the conference does not vote to meet in a specific site, the conference will be held in San Diego, California, and the conference members will elect a state to serve as host state to perform the functions discussed in these procedures.

V. Committees

The conference will have both permanent standing committees and special committees.

A. Most of the work of the conference is accomplished by duly constituted official committees.

B. Each committee has a chairman. A secretary, or recorder, may be elected by the committee or appointed by the chairmans, if necessary. Committee chairmans are selected by the Steering Committee or are elected by the conference.

C. The kinds of committees and their charges are determined by the Steering Committee, based on the recommendations of the conference. Committee members are appointed by the Steering Committee after first determining the interests of conference members. The Steering Committee will assure that there is a balance among states and among agencies or each committee - that is no one state or agency will dominate any single committee.

D. Each committee shall make an official report at the designated time at each biennial conference. Committee reports shall be duplicated and copies distributed as follows:

1. One copy to each permanent member (whether present or not) and to each participant in the conference.

2. One final copy to the Conference Secretary for inclusion in the conference proceedings. This copy will include all revisions approved by the conference.

note. Committee Chairmen are responsible for prompt submission of their reports to the Chairman of the Steering Committee who will duplicate and distribute the reports. This should be done prior to the holding of the conference.

E. Most of the committee work will be, of necessity, conducted by correspondence between biennial conferences. Committee chairmen are responsible for initiating and carrying out this work.

F. Permanent Standing Committees may be established by the conference. These committees will report to each biennial conference until such time as they are disbanded. Permanent Standing Committees are:

1. Western Regional Soil Research Committee

The NSSC will distribute proposed taxonomy amendments to all states and National Offices of cooperating agencies. The NRCS state soils representative will distribute to cooperators in each state for review and comments.

G. A Conference proceedings will be developed for each biennial conference. It will be compiled by the conference secretary and reproduced and distributed by the conference chairman, with assistance from the Steering Committee Chairman.

Sufficient copies will be reproduced for distribution as follows:

1. One copy for each permanent member, whether in attendance or not.

2. One copy for each associate member in attendance at the conference.

3. Twenty copies for the Chairman of the Steering Committee of the National Cooperative Soil Survey Conference.

4. Twenty-five copies for the Steering Committee Chairman of the other three regional conferences.

VI. Amendments

Any part of this statement of purposes, policy and procedures may be amended at any time by simple majority vote of the conference members present at a conference, or by a mail vote of the permanent members.

THE STEERING COMMITTEE
of the
WESTERN REGIONAL COOPERATIVE SOIL SURVEY CONFERENCE

I. Membership

The Steering Committee consists of the following members:

Head, Soils Staff, Western States (permanent chairman)
The current (or forthcoming) conference chairman
The current (or forthcoming) conference co-chairman
The current (or forthcoming) conference secretary
The immediate past conference chairman
All other permanent members of the conference from the host state
Membership changes upon election of officers at the conference
(or upon the selection of meeting sites)

II. Meetings and Communications

A. Regular Meetings

At least one meeting is held at each conference. Additional meetings may be scheduled by the chairman as the need arises. Whenever possible, the committee will meet at conference center prior to the conference to review space and accommodations, and to assure equipment will be available for the conference.

B. Extra Meetings

Extra meetings of the committee may be held between conferences if convenient and necessary.

note: Most of the committee's communications will be by correspondence. Copies of all correspondence related to the conference will be sent to both the Steering Committee chairman and the conference chairman.

III. Authority and Responsibilities

A. Conference Members and Participants

1. The Steering Committee formulates policy on conference membership and participation. Final approval or disapproval of policy changes is by a vote of the conference.

2. The Steering Committee approves the attendance of guests or nonmembers at a specific conference.

B. Conference Committees and Committee Chairman

1. Upon the recommendation of the conference, the Steering Committee formulates the conference committee membership and appoints committee chairman. Insofar as possible, committee membership is guided by expressions of individual preferences and interests. The Steering Committee will, however, strive to assure that no one committee is dominated by any single state or agency.

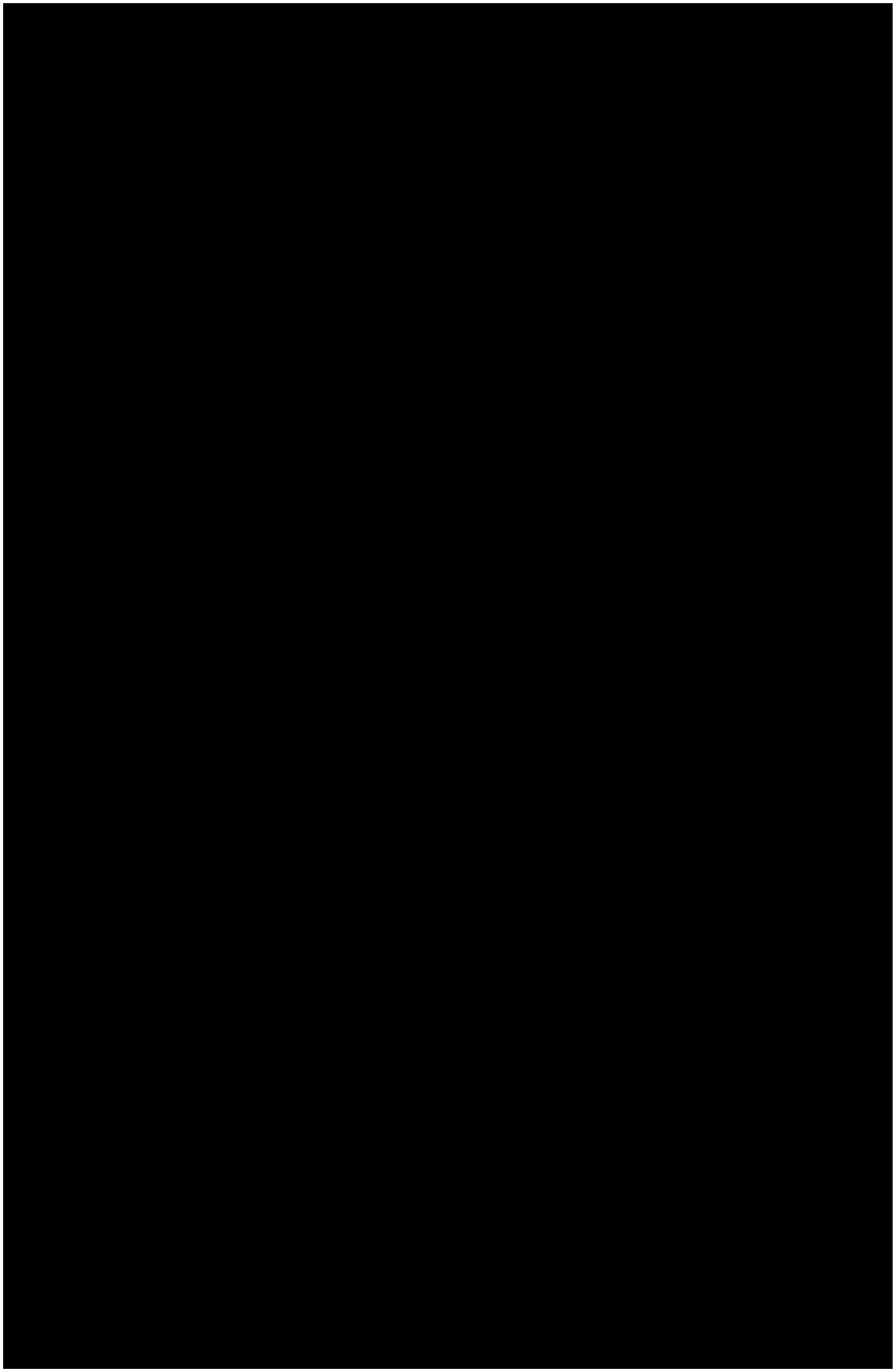
2. Upon the recommendation of the conference, the Steering Committee is responsible for the formation and transmittal of specific charges of the committee chairman.

C. Conference Policies

The Steering Committee is responsible for the formulation of statements of conference policy. Final approval of such statements is by vote of the conference.

D. Liaison

The Steering Committee is responsible for maintaining liaison between the conference and (a) the National and other regional conferences, (b) the Western Regional Soil Survey Work Group, (c) the Western experiment station directors, the state or regional and National offices of the Soil Conservation Service, Forest Service, Bureau of Land Management, Bureau of Indian Affairs, and Bureau of Reclamation, (d) the Westem Soil and Water Research Committee, (e) other committees or work groups associated with the conference, and (f) other participating agencies or groups.



1899 Soil Survey Centennial 1999

The soil survey celebrates a centennial in 1999. The event celebrates the accomplishments of soil survey, but more importantly it provides a time to focus attention on soil resources and to market soil information.

Historical item collection Pictures, equipment, references, and other historical items related to the soil survey have been collected from contributions from NRCS, Universities, and individuals. Items capture the history of soil survey and enhance exhibits.

Historical Volume on Soil Survey The history of soil survey in the United States is being written.

Reprints In 1957 David Gardner for his degree at Harvard produced a history of the soil survey. This history reference has had very little circulation and is being reprinted. ***Criss cross Trails*** by Macy Lapham records the experiences of a field soil scientist during the 1920's. Reprinting is being considered.

Video tape presentation All states received the video **"Tools of the Trade" 100 Years of Exploring Soil Resources** prepared by the National Soil Survey Center.

NRCS Soil Survey Centennial Communications Plan The communication plan for the soil survey centennial targets educators, legislators, and land users. Packets are in development for marketing soils to each of these audiences. Exhibit materials and hand outs will be available for states to use. Specifics arc in the communications plan.

International Soil Conservation Organization This meeting utilizes the soil survey centennial to highlight the application of soil survey to sustaining global farms. A pre-conference tour begins in Nebraska City, Nebraska with a symposium on the history and application of soil survey.

Soil And Water Conservation Society The 1998 meeting includes two sessions highlighting soil survey. The retired SCS employees association is honoring former soil scientists at the 1999 meeting.

National Cooperative Soil Survey Conference This 1999 conference will recognize former soil scientists and hold a field trip including some historical aspects of soil survey.

Soil Science Society Symposia, presentations, and tours The Soil Science Society of America conducted symposia and tours on the history of soil survey each year since 1993. These symposia have stimulated the documentation of the history in soil survey.

Soil Science Society of America Centennial Year Activities SSSA celebrated the 50th anniversary in 1949 and the 75th in 1974. Plans for the 1999 meeting are forming. The 1999 meeting will be in Salt Lake City. Planned is a midweek field trip of one of the first soil surveys. Various speakers and symposia will highlight the application of soil survey and cover the significant benefits soil survey has made.

Special display The Chicago Field Museum is highlighting the Soil Survey Centennial with the April 1999 opening of a new 14,000 square foot soils exhibit.

Exhibits Display materials for exhibits will be part of a package available to states for use during the centennial. Display material will consist of panels for Nomadic displays with handout material. Exhibits will show in many national meetings.

Calendar of the 12 Soil Orders A calendar for the 1999 centennial year with the 12 soil orders illustrated is being,printed. Potash and Phosphate Institute shared the cost.

Soil Order Chart A wall chart prepared for release with the revised edition of Soil Taxonomy will be part of the information campaign packet.

Promotional products NACD has several different centennial products in their products catalog for the centennial. Mugs, hats, plaques, notebooks, mousepads, refrigerator magnets, and other items are available.

Guy D. Smith Memorial Slide Set The Soil Survey Division is releasing an educational slide set of over 3000 slides of soils from around the world for the centennial.

State Soils All states have selected a state soil. Fourteen states have adopted a soil through their legislature. A picture of the landscape and soil profile accompany a soil description and laboratory data for teacher and student access. Posters, fliers, and other promotions conducted by states use their state soil.

Posters 6000 posters of the soil survey centennial posters are in press for distribution to all offices within NRCS and to partners.

Salt Lake Valley Soil Survey Map Reprints of the 1899 soil survey map of the Salt Lake Valley are available for use at the 1999 SSSA meeting in Salt Lake. This area was one of the first three soil surveys.

Anecdotes within soil survey Anecdotes about soil survey experiences are available.

Logo A logo designed for the soil survey centennial promotes products, stationary, soil surveys publications, and other items during 1998 and the centennial year.

State and local activities Displays and activities by local soil scientists and others within their own regions will market soil survey information.

Gary Muckel at the National Soil Survey Center is chair of the soil survey centennial.

Soil Survey Centennial Marketing Team

In February, 1998, the Soil Survey Centennial Marketing Team began work on its charge to develop a communication plan to convey key messages to three specific audiences on the continued importance of the soil survey program and the fragility of our limited soil resource. The plan is to help NRCS at the national, state and field levels, and our soil survey partners, celebrate and communicate these messages. Media and public information efforts will focus on 1999, the centennial anniversary of the Soil Survey.

Many thanks to the Soil Survey Centennial Marketing Team and the subgroup* which drafted the communications plan.

Horace Smith
Diana Morse*
Renae Anderson*
Perdita Belk
Tom Calhoun
Hari Eswaran
Michele Frome
Doug Helms
Greg Larson
Dora Richardson
Barry Dutlon*
Jon Vrana
Gordon Younker
*Gary Muckel
Bob Mcleese
Richard Arnold
Janice Boettinger
Ed Ciolkosz
Eugenia Flatow,
Richard Griffin
Kip Kolesinskas
Dean Martin
Donn Smith
Arlene Tugel
Cleveland Watts

United States Department of Agriculture
Natural Resources Conservation Service **June 1998**

Materials Currently Available

Contact: Gary Muckel, National Soil Survey Center

Federal Building, Rm 152, 100 Centennial Mail North, Lincoln, NE 68508
402-437-4148, fax 402-437-5336, gmuckel@nssc.nrcs.usda.gov

Or contact the NRCS State Soil Scientist in your state.

- Displays-8x10' or double 8x10 versions
- Tools of the Trade videos shipped to each NRCS state office. 16.5 min for high school/college level, University soils depts.
- All states have selected a state soil
- nscss.org web page Soils Information Library - all states should add links to it
- Logo Poster - 6,000 available with all office distribution
- Soil Centennial Logo - graphic files available for download, states may modify as appropriate to add agency name or other text.
- Soil Survey Centennial Calendar. 20,000 copies sponsored by Potash Phosphate Institute
- Reference collection of historical soil survey articles
- Collection of Anecdotes on soil survey
- Reprints of David Gardner History of Soil Survey and of Criss Cross Trails
- Guy D. Smith memorial Slide Set
- Release of Soil Taxonomy publication (fall 1998)
- Historical item collection at Naitonal Soil Survey Center

Planned Events and Opportunities

- Chicago Field Museum -'Life Underground -Foundations of the Biosphere" a new permanent exhibition. Opens Spring 1999.
- White House Millennium program
- USDA Radio News
- USDA Video News Release
- SWCS,1998 San Diego, CA and 1999 Biloxi, Miss.
- World Congress of Soil Science-Montpelier, France 1998
- International Soil Conservation Organization-Purdue University
- Soil and Water Conservation Society Annual Conference
- National Cooperative Soil Survey conference 1999 in St. Louis
- Exhibit in main USDA building
- State and other histories in symposia, historical tours at SSSA